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WAR MACHINE

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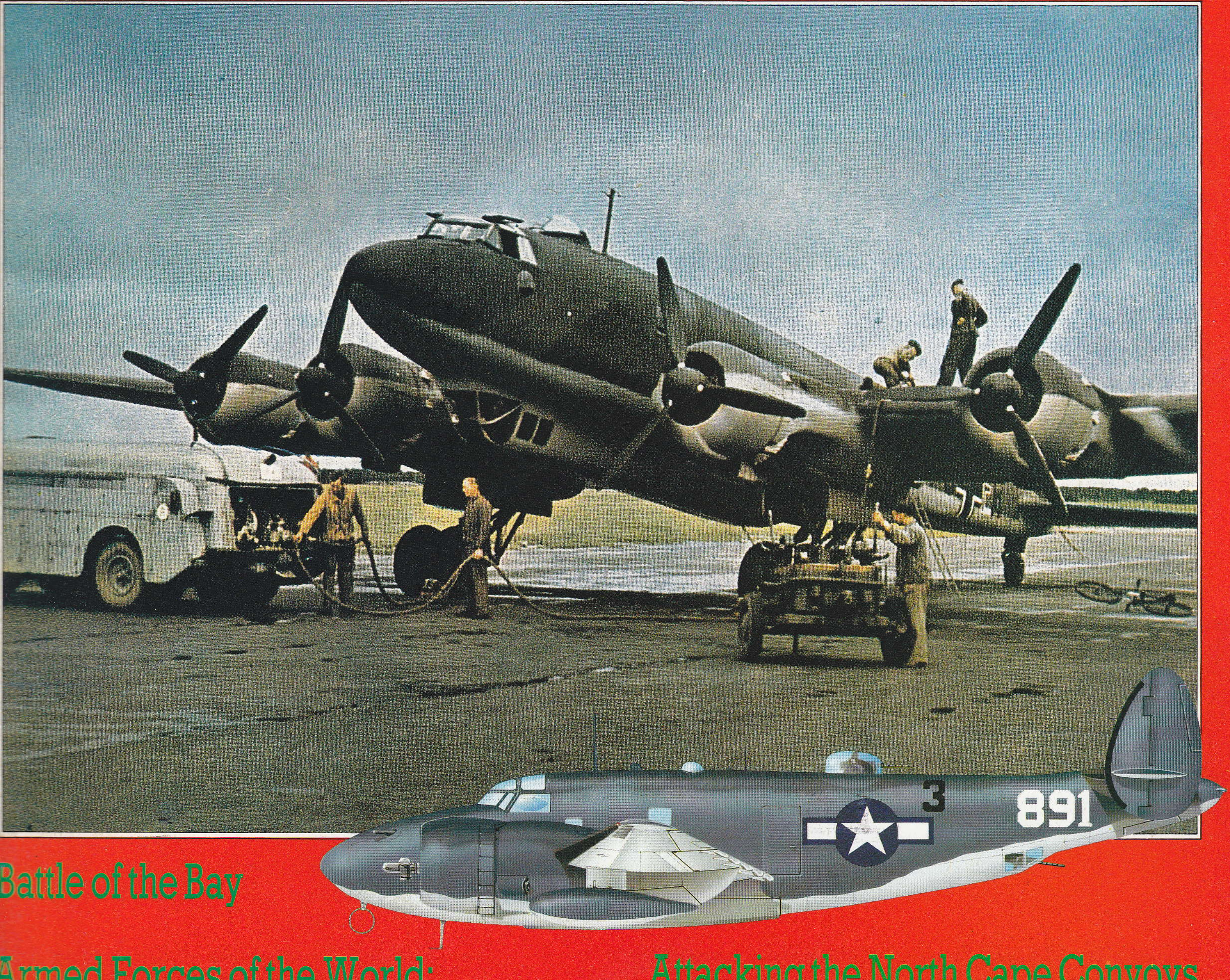

Battle of the Bay

Armed Forces of the World:
British Army (Part 3)

Attacking the North Cape Convoys

Lockheed PV-1/PV-2 in Action

A fully illustrated guide to Anti-Shipping Aircraft of World War II

WAR MACHINE

Volume 7 **Issue 75**

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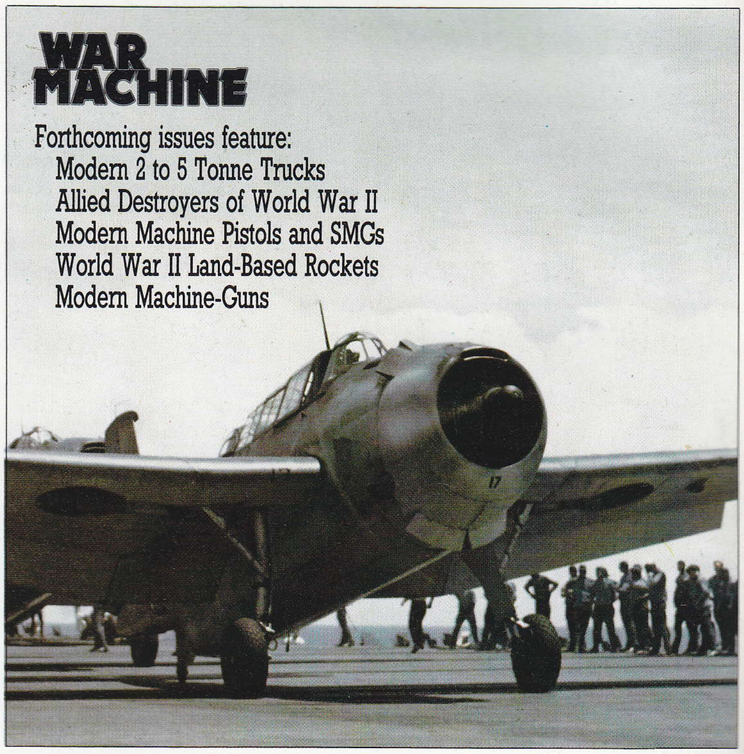

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Anti-Shipping Aircraft of World War 11

Japanese cargo ships plying the islands of the Dutch East Indies were faced with the constant threat of attack from Consolidated Liberators of the USAAF 13th Air Force, here seen strafing two ships caught in the open.

Attacks against shipping around the war-zone coasts, and the incessant vigil against submarines, kept many aircraft busy throughout the war. These ranged from fighters to heavy bombers, all playing their part in denying the enemy freedom of the seas.

Of all the nations drawn into World War II during 1939 and 1940 none had more pressing needs of anti-shipping aircraft than the UK for, as a sea-girt power, her lifelines were critically vulnerable to attack from surface raider, submarine and aircraft alike. Yet responsibility for defence against this threat was, as had been for centuries, vested almost exclusively in the Royal Navy. Lip service had been paid to the RAF with the provision of such aircraft as the Avro Anson, while the Lockheed Hudson began arriving from America in 1939 to provide relatively long-range reconnaissance/attack muscle for Coastal Command.

As in so many of the wartime air forces, the emergence of the maritime strike role after the outbreak of hostilities brought about the demand for adaptation of obsolescent aircraft (fighters, bombers and even transports) to meet the operational requirements. The parameters of the requirements themselves were so broad (the equation of long-range navigation accuracy over featureless oceans, precision of attack equipment and a wide assortment of weapons which included cannon, depth charges, bombs, rockets and torpedoes) that no single aircraft could be considered ideal. Moreover, beyond the scope of this study were the other important anti-shipping aircraft, the minelayers.

It may be said that premeditated anti-shipping operations, as distinct from long-range anti-submarine attacks which were usually the result of chance sightings during tedious ocean patrols, were largely confined to the 'narrow seas' around Europe, from the North Cape of Norway to the Mediterranean, although the US and Japanese air forces also engaged in anti-shipping operations in the Pacific, particularly during the latter part of the war, as did the RAF in the Bay of Bengal.

Ignoring the relatively fruitless efforts by Bristol Blenheims and Ansons in the early months, the RAF began to achieve worthwhile successes when such aircraft as the Vickers Wellington, Bristol Beaufort and Bristol Beaufighter arrived in Coastal Command, while in the Axis air forces the Dornier Do 217 and Junkers Ju 88 proved fairly effective, particularly in operations against the Allied North Cape convoys, in which the Heinkel He 111 also participated. In the Savoia-Marchetti S.M.79 the Italians also possessed an excellent torpedo bomber which was flown to good effect against British shipping in the Mediterranean.

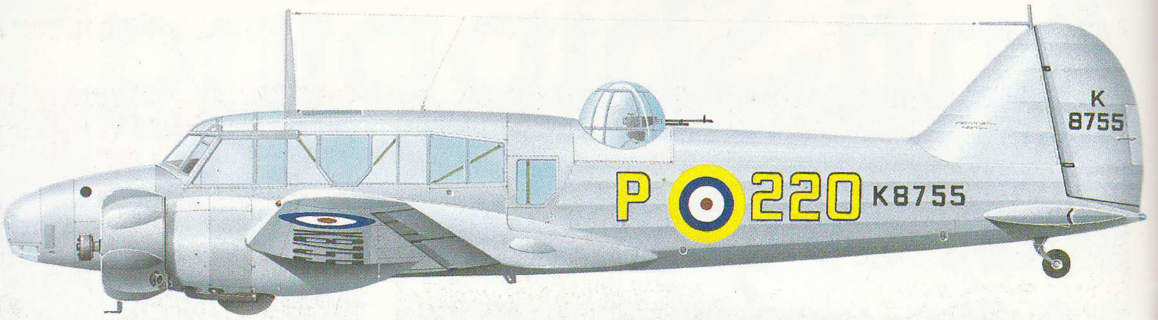
The Americans, however, were caught largely unprepared for anti-shipping tasks and so relied heavily on adaptation of the Boeing B-17 and Consolidated B-24, the latter's very long range suiting it admirably for ocean patrol and long-distance attack. Likewise the Japanese, despite embarking on their far-flung Pacific campaign, had assumed that carrierborne attack bombers would embrace the majority of maritime strike operations. Such was the nature of the organization of the Imperial Japanese Navy, however, that from the first days of the Pacific war considerable dependence was placed on land-based anti-shipping bombers, and it was the Mitsubishi G3M that participated in the successful attack on the British capital ships HMS *Prince of Wales* and HMS *Repulse*, one of the war's most successful air strikes against major warships at sea.

Manning a German minesweeper in the North Sea during 1944-5 was not the best of postings. Here an 'M' class boat receives the attention of Coastal Command Beaufighters armed with rockets and cannon. This action occurred north west of Borkum on 25 August 1944.

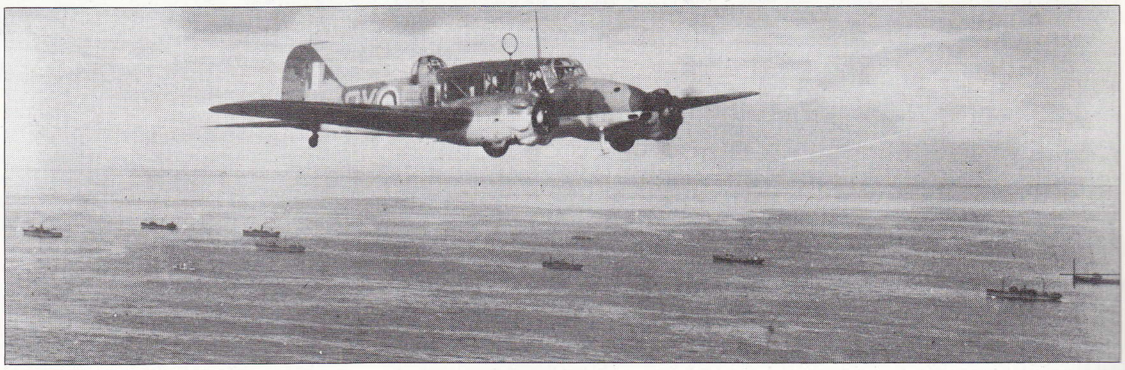
UK

Avro Anson

Anachronistic relic of pre-war RAF expansion, the **Avro Anson** was originally the result of a coastal reconnaissance aircraft requirement, and was developed from a six-seat commercial aircraft. It first flew on 24 March 1935 and, powered by Cheetah engines, the **Anson Mk I** entered service with No. 48 Squadron in March 1936, and was the first RAF aircraft with a retractable landing gear, albeit manually operated. The Anson subsequently served with 12 squadrons of Coastal Command up to the beginning of the war, when the first Lockheed Hudsons were just beginning to arrive from America. Nevertheless Ansons were retained on short-range coastal reconnaissance duties in diminishing numbers until 1942, occasionally having brushes with the enemy. By the beginning of the war, however, the Anson was already in use as an aircrew trainer for navigators, wireless operators and air gunners, and it was for this long and priceless service that the 'faithful Annie' is best remembered. Jacobs- and Wright-powered **Anson Mk III** and **Anson Mk IV** aircraft were shipped to Canada to equip the growing numbers of flying schools under the Commonwealth Air Training Scheme. Canadian manufacturers also producing the **Anson Mks II, V** and **VI**. Light transport conversions from the Anson Mk I resulted in the **Anson Mks X, XI** and **XII**, some of which were employed as air ambulances; the **Anson Mk XI** was powered by Cheetah XIX engines driving Fairey-Reed metal propellers, and the **Anson Mk XII** had Cheetah XVs driving constant-speed Rotol propellers. Production, which continued after the war with the **Anson Mks 19, 20, 21** and **22**, reached a total of 11,020 aircraft, including 2,822 built in Canada.



Avro Anson GR.Mk I of No. 220 Sqn, Coastal Command, in the overall silver pre-war paint scheme.



Ever on the alert, an Anson of No. 48 Sqn keeps watch on a convoy out of Liverpool. At the outbreak of war, the Anson formed the bulk of Coastal Command's fleet. No. 48 Sqn was based at Hooton Park to protect the Western Approaches.

Specification

Avro Anson Mk I

Type: three-seat general-reconnaissance aircraft

Powerplant: two 350-hp (261- kW) Armstrong Siddeley Cheetah IX radial piston engines

Performance: maximum speed 303 km/h (188 mph) at 2134 m (7,000 ft); initial climb rate 219 m (720 ft) per minute; service ceiling 5791 m (19,000 ft); range 1271 km (790 miles)

Weights: empty 2438 kg (5,375 lb); maximum take-off 3629 kg (8,000 lb)

Dimensions: span 17.22 m) (56 ft 6 in); length 12.88 m (42 ft 3 in); height 3.99 m (13 ft 1in); wing area 43.01 m^2 (463.0 sq ft)

Armament: one fixed forward-firing 7.7-mm (0.303-in) machine-gun in nose and one 7.7-mm machine-gun in dorsal turret, plus provision to carry up to 163 kg (360 lb) of bombs

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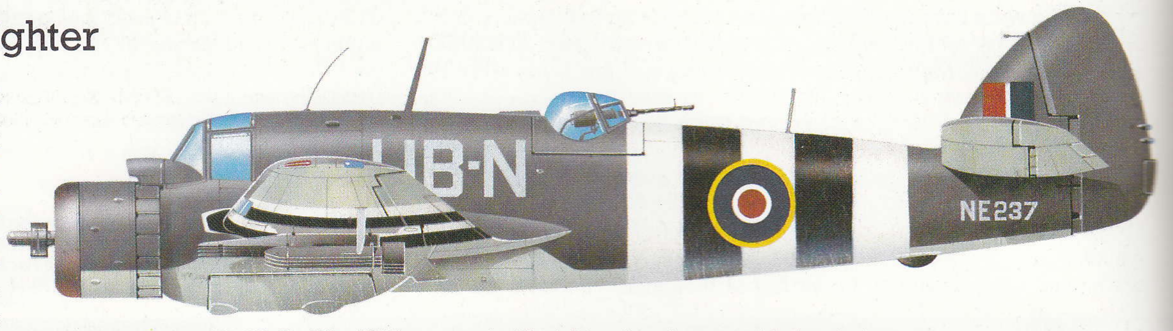
UK

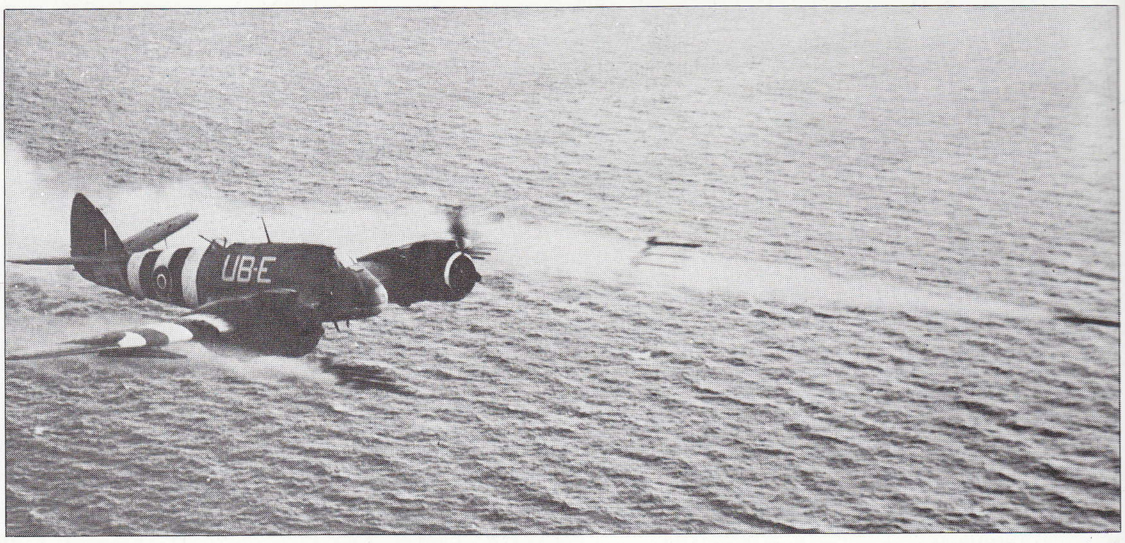
Bristol Beaufighter

To a large extent responsible for the defence against the German Blitz of 1940-1 as the RAF's first purpose-built night-fighter, the **Bristol Beaufighter** remained in service as such almost to the end of the war. Such was its performance, however, that in 1941 it also came to be developed, first as an intruder and, as a natural follow-on, a specialist anti-shipping strike aircraft. It was moreover no stranger to RAF Coastal Command, the **Beaufighter Mk IC** having been specially prepared as a long-range maritime fighter with additional navigation and radio equipment. The **Beaufighter Mk VIC** with 1,650-hp (1230.4-kW) Hercules VI or XVI radials featured for the first time an additional dorsal machine-gun to provide token defence against enemy fighters which Coastal Command squadrons frequently encountered over the Bay of Biscay.

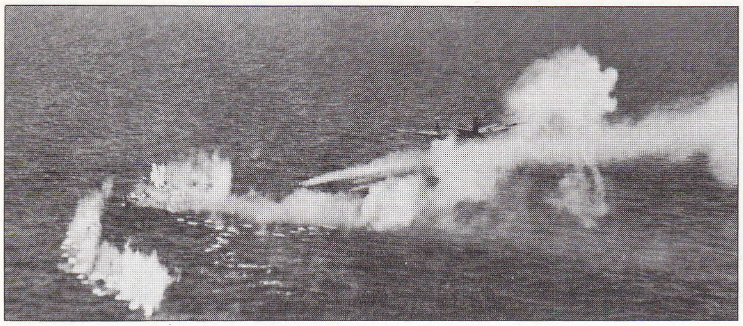
As early as March 1941 a Beaufighter Mk I underwent trials with a torpedo, and in September the following year another aircraft was fitted with 76.2-mm (3-in) rocket projectiles. Two months later the first Beaufighter Strike Wing was formed at North Coates, Lincolnshire, comprising No. 143 Squadron (Beaufighter fighters), No. 236



Bristol Beaufighter TF.Mk X of No. 455 Sqn armed with eight underwing, unguided rockets.



Towards the end of the war, the unguided rocket became the major anti-shipping weapon, especially against the small targets often encountered in the Channel. These were usually ripple-fired.



Beaufighters were particularly accurate against shipping, proving to be a steady platform during the diving attack. As well as serving in home waters, the Beaufighter had great success against Japanese shipping.

Beaufighter attack! Trailing vortices from its wingtips, this 'Beau' is pulling out from its strike against a German ship. Further aircraft behind it succeed in turning the water white.

Squadron (Beaufighter bombers with a pair of 113- or 227-kg/250- or 500-lb bombs) and No. 254 Squadron ('Torbeau' torpedo-carrying Beaufighters). By the spring of 1943 the wing was in frequent action against German supply ships sailing between enemy-held ports in the North Sea. In May that year rocket-firing Beaufighter Mk VICs entered service, their principal task being to attack escorting *Flak* ships while the torpedo aircraft and bombers went for the enemy merchantmen.

As the Beaufighter was gradually replaced in service as a night-fighter its importance as a maritime strike aircraft grew. The **Beaufighter TF.Mk X** was introduced with ASV (air-to-surface vessel) radar and carried universal racks which enabled combinations of bombs, rockets and torpedo to be carried. Strike Beaufighters served with a total of 11 home-based Coastal Command squadrons, and seven in the Middle East. The aircraft reached the Far East in January 1943 and soon afterwards began to re-equip five strike squadrons (Nos 22, 27, 177, 211 and 217), proving deadly when flown against Japanese shipping being sailed along the Burma coast.

Specification

Bristol Beaufighter TF.Mk X

Type: two-seat torpedo-strike fighter

Powerplant: two 1,770-hp (1319.9-kW) Bristol Hercules XVII 14-cylinder air-cooled radial piston engines

Performance: maximum speed 488 km/h (303 mph) at 396 m (1,300 ft); climb to 1524 m (5,000 ft) in 3.5 minutes; service ceiling 4572 m (15,000 ft); normal range 2366 km (1,470 miles)

Weights: empty 7076 kg (15,600 lb); maximum take-off 11431 kg (25,200 lb)

Dimensions: span 17.63 m (57 ft 10 in); length 12.70 m (41 ft 8 in); height 4.82 m (15 ft 10 in); wing area 46.73 m^2 (503 sq ft)

Armament: four 20-mm Hispano cannon in nose and one 7.7-m (0.303-in) machine-gun in dorsal position, plus either eight 76.2 mm (3-in) rocket projectiles and two 227-kg (500 lb) bombs or a single 748-kg (1,650-lb) or 965-kg (2,127-lb) torpedo

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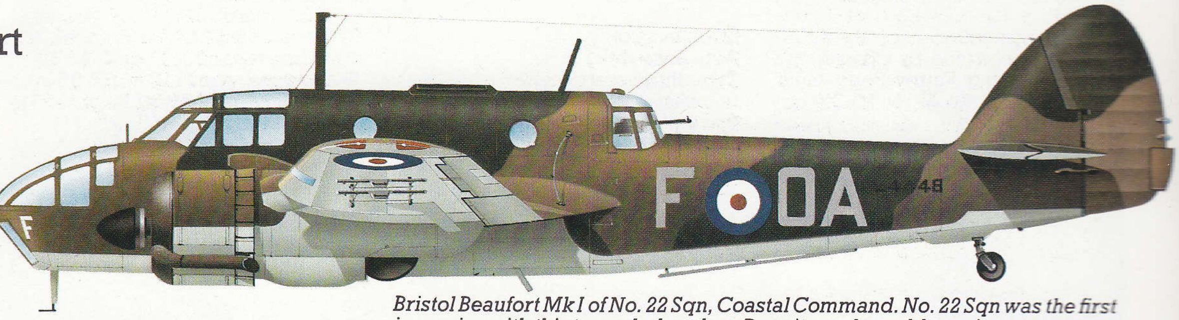
UK

Bristol Beaufort

Until superseded by the torpedo-carrying Beaufighter, the **Bristol Beaufort** was the RAF's standard torpedo-bomber from 1940 to 1943, replacing the aged Vickers Vildebeest biplane. First flown on 15 October 1938, the **Beaufort Mk I**, of which early versions were powered by 1,010-hp (753.2-kW) Bristol Taurus II radials (later replaced by Taurus VIs), joined No. 22 Squadron in December 1939 and carried out their first minelaying sortie on 15-16 August 1940. Beauforts also dropped the RAF's first 907-kg (2,000-lb) bomb on 7 May. Total production of the Beaufort Mk I was 965, and this version was followed by the **Beaufort Mk II** with American Pratt & Whitney Twin Wasp radials, production continuing until 1943, by which time 415 had been produced. The final Beaufort Mk IIs were completed as trainers with the two-gun dorsal turret deleted. Beauforts equipped six Coastal Command squadrons in the United Kingdom and four in the Middle East, their most famous operations being carried out against the German warships *Scharnhorst* and *Gneisenau* on 6 April 1941 in Brest harbour (which earned a posthumous VC for Flying Officer K. Campbell of No. 22 Squadron), and during the warships' escape up the English Channel early in 1942. Beauforts were also very active while based on Malta, attacking Axis shipping being sailed to North Africa. The **Beaufort Mks V-IX** were built in Australia for the RAAF in the Far East, production totalling 700.



Bristol Beaufort Mk I of No. 22 Sqn, Coastal Command. No. 22 Sqn was the first in service with this torpedo-bomber. Despite early problems, it went on to provide useful service.

Specification

Bristol Beaufort Mk I

Type: four-seat torpedo-bomber

Powerplant: two 1,130-hp (842.6-kW) Bristol Taurus VI radial piston engines

Performance: maximum speed 426 km/h (265 mph) at 1829 m (6,000 ft); service ceiling 5029 m (16,500 ft); range 2575 km (1,600 miles)

Weights: empty 5942 kg (13,100 lb); maximum take-off 9629 kg (21,228 lb)

Dimensions: span 17.62 m (57 ft 10 in); length 13.49 m (44 ft 3 in); height 4.34 m (14 ft 3 in); wing area 46.73 m^2 (503.0 sq ft)

Armament: two 7.7-mm (0.303-in) machine-guns in nose and dorsal turret (some aircraft had a rear-firing machine-gun under the nose and two in beam-firing positions), plus a bombload up to 907 kg (2,000 lb) or one 728-kg (1,605-lb) 457-mm (18-in) torpedo

No. 217 Sqn flew its Beauforts from Malta, and these were responsible for many of the problems faced by Axis shipping in the Mediterranean. Only one torpedo could be carried, but the aircraft possessed bombing and minelaying capability.

UK

de Havilland Mosquito

In much the same manner that the Beaufighter came to be introduced into RAF Coastal Command as an anti-shipping strike fighter, so the classic **de Havilland Mosquito** achieved considerable success in this role, being used principally with rocket projectiles and bombs. A torpedo-carrying version was under development at the end of the war.

It was not until the Mosquito had been successfully developed as a fighter-bomber (effectively combining its night-fighter cannon armament with its ability to carry bombs internally) that the **Mosquito FB.Mk VI** was selected for service with Coastal Command, trials being undertaken at Boscombe Down with an aircraft fitted with eight 76.2-mm (3-in) rocket projectiles under the wings. In addition to a nose armament of four 20-mm and four 7.7-mm (0.303-in) guns, the Mosquito FB.Mk VI could also carry a pair of short-finned 227-kg (500-lb) bombs in the rear of the bomb bay; alternatively, later aircraft were strengthened to carry a further pair of 227-kg (500-lb) weapons under the wings in place of the rockets.

Following the success of the Beaufighter anti-shipping strike wings in 1943, a Mosquito Strike Wing was formed at Banff in Scotland before the end of that year, No. 333 (Norwegian) Squadron being the first to receive Mosquito FB.Mk VIs in November. No. 248 Squadron followed in the next month, and No. 235 in June 1944. Employed almost exclusively against enemy shipping off the Norwegian coast, the Norwegian pilots of No. 333 Squadron usually flew as pathfinders for the wing, leading Mosquito formations along the winding fjords in search of German vessels.

Of greater interest than true operational value was the **Mosquito FB.Mk XVIII** anti-shipping strike aircraft, armed with a single 57-mm Molins gun in the nose. A converted Mosquito FB.Mk VI thus armed made its first flight on 25 August 1943, after which 27 production aircraft were built and entered service with No. 248 Squadron at Banff in January 1944. Detachments were sent south for patrols over the English Channel and on 25 March a Mosquito FB.Mk XVIII pilot attacked and claimed to have sunk an enemy submarine off the French coast. Weighing over 907 kg (2,000 lb), the Molins gun was not considered a success as its recoil constantly caused local structural damage in the Mosquito's nose. No. 248 Squadron retained its aircraft until February 1945, after which the survivors were handed over to No. 254 Squadron at North Coates for the remainder of the war.

Specification

de Havilland Mosquito FB.Mk VI

Type: two-seat anti-shipping strike fighter

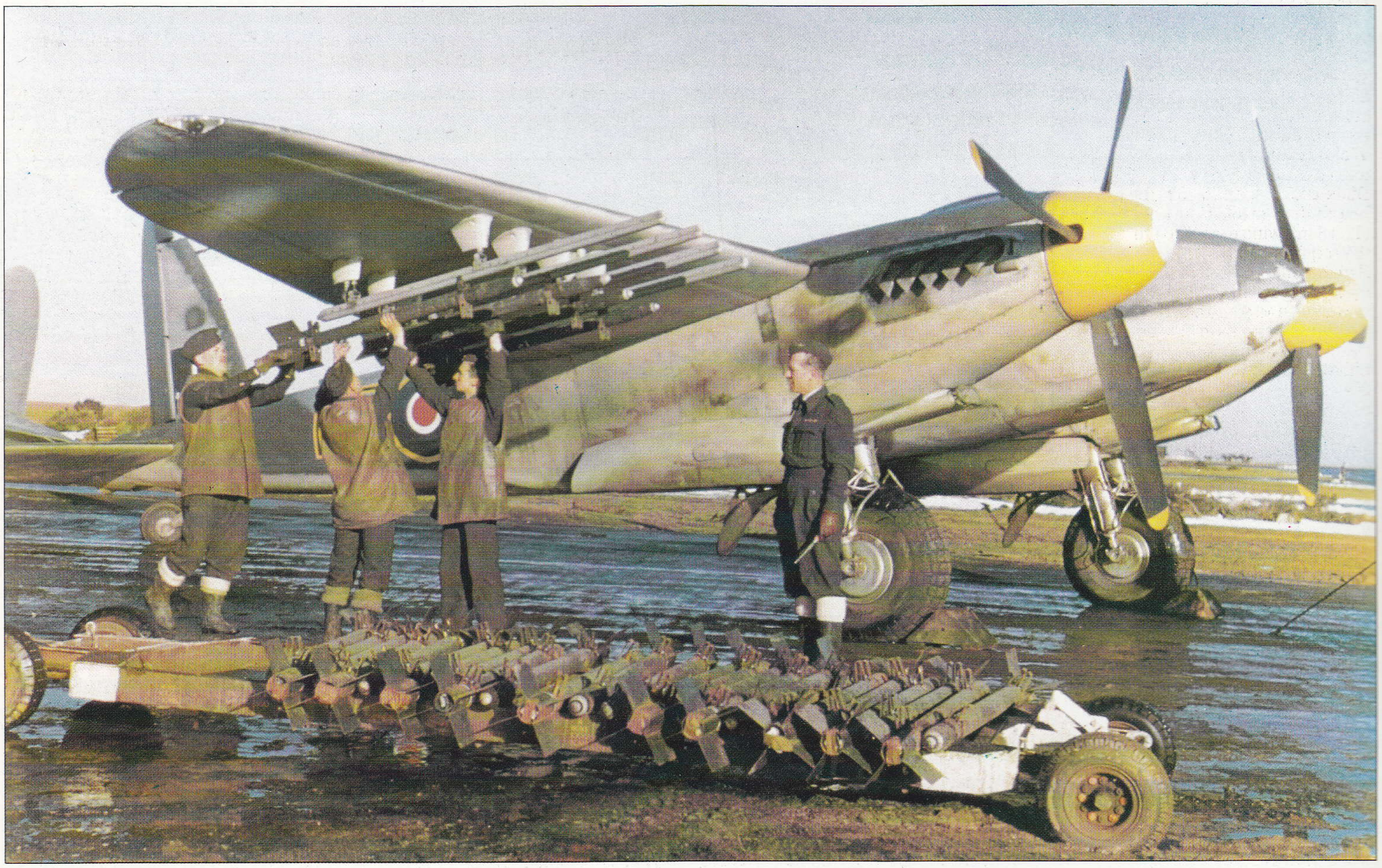
Powerplant: two 1,230-hp (917.2-kW) Rolls-Royce Merlin XXI 12-cylinder liquid-cooled inline piston engines

Performance: maximum speed 612 km/h (380 mph) at 3962 m (13,000 ft); climb to 4572 m (15,000 ft) in 7.0 minutes; service ceiling 10972 m (36,000 ft); normal range 2092 km (1,300 miles)

Weights: empty 6486 kg (14,300 lb); maximum take-off 10115 kg (22,300 lb)

Dimensions: span 16.51 m (54 ft 2 in); length 12.34 m (40 ft 6 in); height 4.63 m (15 ft 3 in); wing area 40.41 m^2 (435 sq ft)

Armament: four 20-mm and four 7.7-mm (0.303-in) guns in the nose, plus either two 227-kg (500-lb) bombs and eight 76.2-mm (3-inch) rocket projectiles or up to four 227-kg (500-lb) bombs



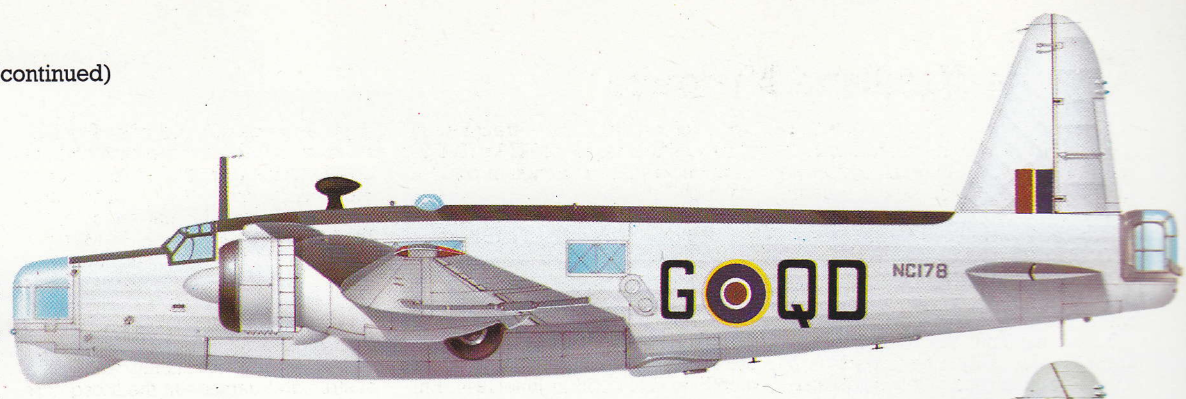
As effective as the Beaufighter, the de Havilland Mosquito was also used in low-level rocket and strafing attacks against shipping. No. 143 Sqn flew its FB.Mk VIs from Banff in Scotland against shipping off Norway.

UK

Vickers Wellington and Warwick

The famous **Vickers Wellington** bomber enjoyed a long and valuable career with RAF Coastal Command in a number of roles, not least in the maritime general reconnaissance role, a term that euphemistically embraced anti-shipping duties. Apart from a small number of Wellingtons equipped for mine-exploding in 1940, Coastal Command's first aircraft specifically prepared for maritime work were **Wellington Mk VIII** machines developed in 1941 for use with the Leigh Light for illuminating surfaced U-boats, particularly in the Bay of Biscay; the first such aircraft were delivered to No. 221 Squadron in the Mediterranean in January 1942, however. ASV radar came to be fitted in some Mk VIIIs (which were in effect conversions of the Wellington Mk IC bomber), but the **Wellington GR.Mk XI** employed the improved airframe of the Wellington Mk X and was capable of carrying a wide range of anti-submarine weapons including two 190.5-kg (420-lb) depth charges or a single 457-mm (18-in) torpedo. The **Wellington GR.Mk XII** was also equipped with a Leigh Light, which retracted into an aperture in the midships fuselage structure. The **Wellington GR.Mk XIII**, intended for daylight use only, omitted the Leigh light but carried two 457-mm (18-in) torpedoes in addition to ASV Mk III radar, while the **Wellington GR.Mk XIV** could carry depth charges or bombs, and featured Leigh Light and ASV Mk III for night operations. Anti-shipping Wellingtons remained in service for the remainder of the war, serving on a total of 21 squadrons at home, in the Mediterranean and Middle and Far East.

A bomber development was the **Vickers Warwick** which, overtaken by technological progress, never survived to serve as such; instead it, like

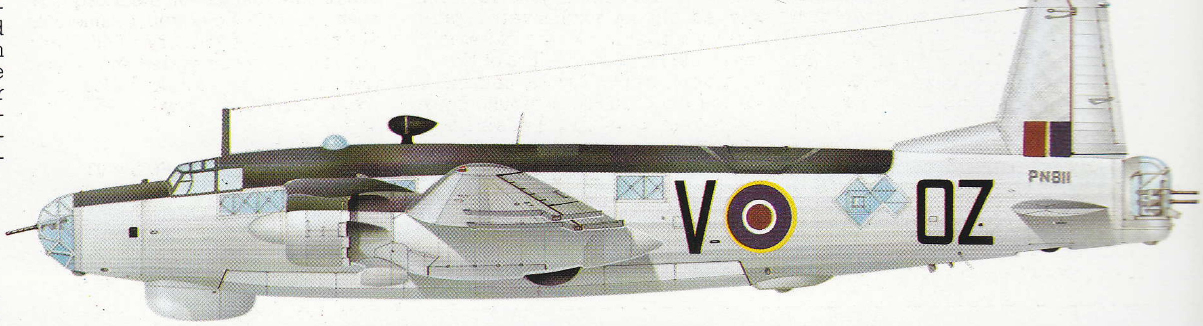


The Vickers Wellington GR.Mk XIV was the final version of this able aircraft used by Coastal Command. This example is a Mk XIV issued to No. 304 (Polish) Squadron in 1944.

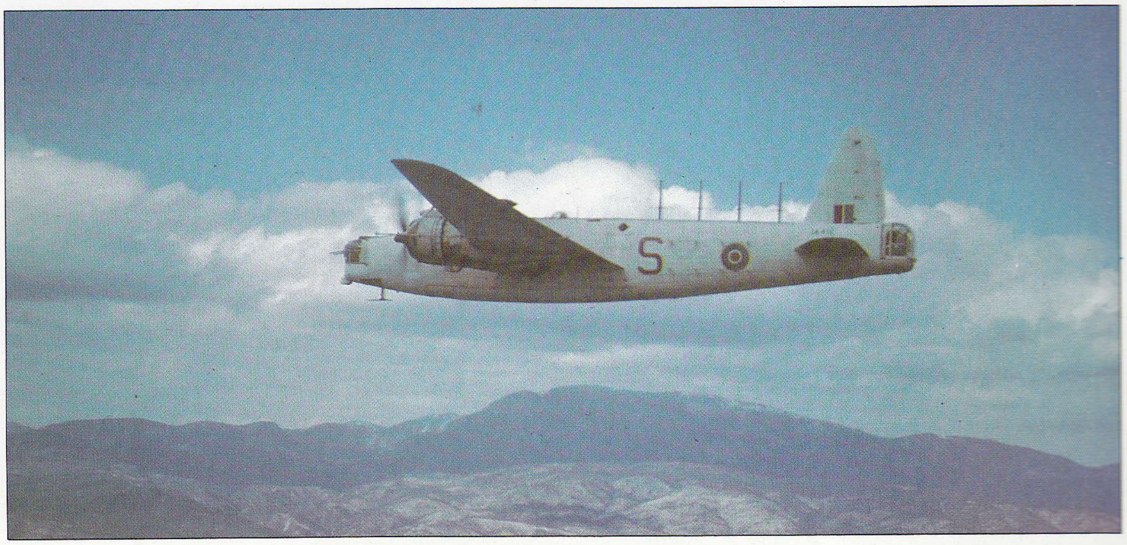
the Wellington, came to be developed for maritime duties. However, although it gave considerable service with Coastal Command in the air-sea rescue role from 1943 onwards, lengthy delays in development (and shortage of Centaurus engines) prevented the **Warwick GR.Mk V**, with Leigh Light and ASV, from entering service with No. 179 Squadron until November 1944; this squadron flew anti-submarine patrols over the Bay of Biscay and the Western Approaches during the last three months of the war.

Specification
Vickers Wellington GR.Mk XIII

Type: six/seven-seat anti-shipping/submarine aircraft
Powerplant: two 1,735-hp (1293.8-kW) Bristol Hercules XVII air-cooled radial piston engines
Performance: maximum speed 406 km/h (252 mph) at 1219 m (4,000 ft); climb to 1219 m (4,000 ft) in 6.9 minutes; service ceiling 4877 m (16,000 ft); normal range 2816 kg (1,750 miles)
Weights: empty 9974 kg (21,988 lb); maximum take-off 14107 kg (31,100 lb)
Dimensions: span 26.26 m (86 ft 2 in); length 19.68 m (64 ft 7 in); height 5.38 m (17 ft 8 in); wing area 78.04 m^2 (840 sq ft)
Armament: two 7.7-mm (0.303-in) machine-guns in nose turret and four in tail turret, and some aircraft mounted two machine-guns in fuselage beam positions, plus an offensive load of either bombs and depth charges up to 2041 kg (4,500 lb) or two 457-mm (18-in) torpedoes



The Warwick GR.Mk V did not enter service until late 1944. It carried ASV radar and a Leigh light and was used over the Bay of Biscay on anti-submarine patrols. This aircraft served with No. 179 Sqn.



Transmitting and receiving aerials for the ASV Mk II radar adorn this Wellington on routine patrol over the Mediterranean. This radar enabled the aircraft to detect small objects projecting above the surface, such as submarine conning towers.

USA

Boeing B-17 Fortress

America's enforced entry into World War II undoubtedly caught her air forces unprepared for maritime operations, and the sudden appearance of long-range U-boats off her eastern seaboard and in the Caribbean caused some 122 aged Douglas B-18Bs to be deployed on anti-submarine patrols along the coasts of the USA. Meanwhile, however, the **Boeing B-17D Fortress**, which had supplanted the B-18 in service with the USAAC's heavy bombardment groups in 1941, had already pioneered anti-shipping operations by this aircraft with an attack against Japanese vessels on 10 December 1941. This was the first occasion on which American aircrews flew an offensive mission. No specialist B-17 version was produced for the anti-shipping role with the American air forces, the machines that were later employed in maritime operations being standard **B-17E** and **B-17F** aircraft.

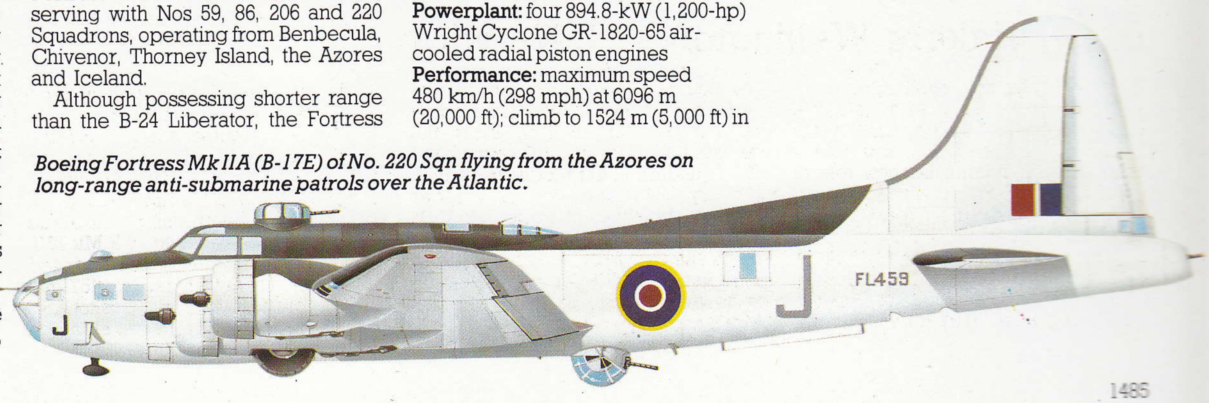
Fortresses were supplied to the RAF in fairly large numbers, however, and after a period of inauspicious service as bombers the survivors of a batch of 20 **B-17C (Fortress Mk I)** aircraft were pressed into service with Nos 206 and 220 Squadrons of Coastal Command for maritime reconnaissance duties over the Western Approaches. Starting in mid-1942 about 150 of the improved B-17E were delivered to Coastal Command as the **Fortress Mk II** and **Fortress Mk IIA**, serving with Nos 59, 86, 206 and 220 Squadrons, operating from Benbecula, Chivenor, Thorney Island, the Azores and Iceland.

Although possessing shorter range than the B-24 Liberator, the Fortress contributed considerably to the patrol efforts demanded by the frequent sailing of wartime convoys, particularly at the height of the great U-boat campaign in the Atlantic. RAF Fortresses were employed on anti-shipping strike missions, their weapons being almost entirely confined to depth charges.

Specification
Boeing Fortress Mk II

Type: eight-seat maritime reconnaissance aircraft
Powerplant: four 894.8-kW (1,200-hp) Wright Cyclone GR-1820-65 air-cooled radial piston engines
Performance: maximum speed 480 km/h (298 mph) at 6096 m (20,000 ft); climb to 1524 m (5,000 ft) in 7.5 minutes; service ceiling 10363 m (34,000 ft); normal range 1835 km (1,140 miles)
Weights: empty 12542 kg (27,650 lb); maximum take-off 24041 kg (53,000 lb)
Dimensions: span 31.62 m (103 ft 9 in); length 22.50 m (73 ft 10 in); height 5.84 m (19 ft 2 in); wing area 131.92 m^2 (1,420 sq ft)
Armament: total of 10 12.7-mm (0.5-in) machine-guns in nose, dorsal, ventral, tail and beam positions, plus a normal bombload of up to 2722 kg (6,000 lb) of bombs and/or depth charges

Boeing Fortress Mk IIA (B-17E) of No. 220 Sqn flying from the Azores on long-range anti-submarine patrols over the Atlantic.



Battle of the Bay

Nowhere was the maritime air war fought more fiercely than over the cold, grey seas of the Bay of Biscay. It became the most valuable area of sea around Europe, as Doenitz's dreaded U-boats were harboured around its margins. The RAF flew as many missions as possible to deny them access to the Atlantic.

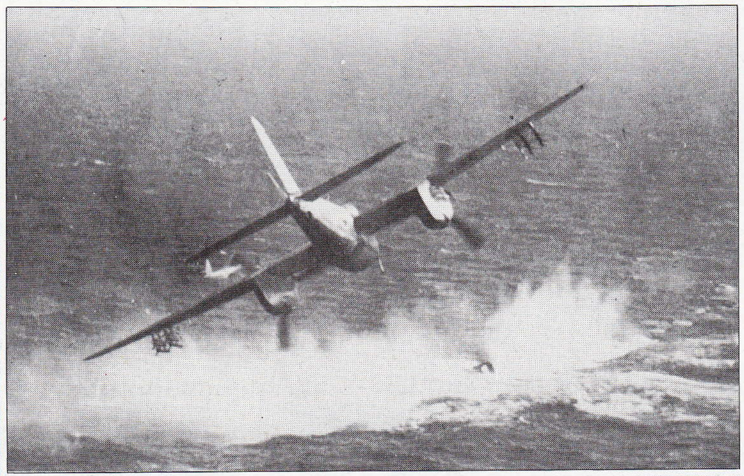
For reasons that will quickly become apparent, the most vicious fighting of the Battle of the Atlantic (insofar as air fighting was concerned) occurred over the Bay of Biscay,that expanse of water off France's western seaboard so well known for its frequent, treacherous storms and heavy seas. It was the possession of that west-facing coast, with its large ports (Brest, St Nazaire, La Rochelle and Bordeaux) gained by Germany in 1940, that enabled the U-boats to operate far out in the Atlantic without the dangerous and fuel-consuming voyage through the North Sea to and from the German home ports. Of course the French bases attracted the growing attention of RAF Bomber Command, and enormous damage was done to the port facilities, but the German Todt organization was quick to construct vast covered concrete submarine pens that were impervious to anything but a direct hit by the heaviest bomb.

Thus it fell to RAF Coastal Command aircrews to operate constant patrols over the Bay of Biscay, maintaining day and night vigilance for enemy submarines setting out for and returning from their ocean forays. Other tasks included keeping watch for German blockade runners, sneaking home from distant ports with vital raw materials, as well as surface raiders which ranged from battle-cruisers such as the *Scharnhorst* and *Gneisenau* to armed merchantmen.

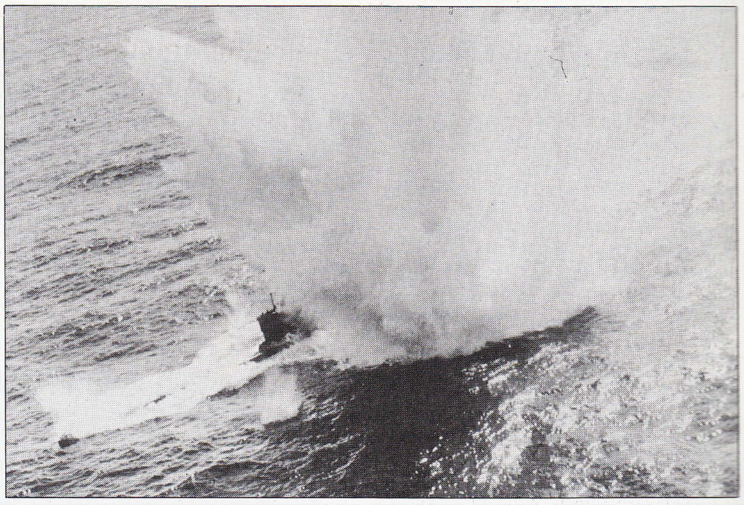
During the early months of the war the RAF was hard pressed to find aircraft of sufficient range to perform worthwhile patrols over the Bay, and still carry adequate armament to attack a ship and to defend themselves if attacked by enemy aircraft. These difficulties were emphasized by the escape of the German warships, *Scharnhorst*, *Gneisenau* and *Prinz Eugen*, from Brest in February 1942. To cover such an eventuality Coastal Command was able to operate patrols by no more than three Lockheed Hudsons whose crews, for a variety of reasons, failed to spot the enemy ships.

The year 1942 nevertheless brought about profound improvements in Coastal Command's ability to tackle the Bay of Biscay more effectively. The Leigh Light was introduced, first in the Vickers Wellington and later in all manner of other aircraft, enabling patrolling crews to spot U-boats as they recharged their batteries on the surface at night. This, used in conjunction with early search radar (ASV), though slow to bring about the destruction of enemy submarines, nevertheless made U-boat captains much less willing to risk sudden attack from the air and, by forcing them to spend more time submerged while in transit to and from their killing grounds, did much to reduce their patrol range. And, although such aircraft as old Armstrong Whitworth Whitley bombers still flew patrols over the Bay, new aircraft like the Bristol Beaufighter were joining Coastal Command to afford protection for the lumbering flying-boats.

An isolated incident serves to illustrate the hazards and difficulties of operations in the Bay. On the night of 11 August 1942 a Leigh Light Wellington of No. 172 Squadron, flown by Flying Officer A.W.R. Trigg, suffered engine failure and had to ditch in high seas. All six crew members managed to clamber into their dinghy, and the following afternoon they were sighted by the crew of a Whitley which dropped a spare dinghy and a Thornaby Bag survival kit. Soon afterwards a Short Sunderland arrived to pick up the ditched crew, escorted by three Beaufighters. Surviving a run-in with a Focke-Wulf Fw 200, the Sunderland crashed on alighting and most of the crew were engulfed by the rough sea. A day passed as the Luftwaffe prevented further Whitleys from reaching the Wellington's crew; then a storm blew up, preventing any air activity over the dinghy for three days, during which the airmen had to contend with an inquisitive shark. At mid-day on 16 August a Beaufighter and Hudson arrived, dropping a Lindholme gear and signalling that a destroyer was coming. At this point the Wellington crew discovered that one of the Sunderland's men had survived in a dinghy nearby, and lashed it to their own. As the destroyer approached, its escorting Beaufighters shot down a Ju 88, only to be set on by Focke-Wulf Fw 190s. Early on 17 August a German launch, escorted by Arado Ar 196 seaplanes and Fw 190s, appeared but, occupied by attacks by the Beaufighters, they were unable to prevent the destroyer from recovering the ditched airmen. Despite constant attacks by Luftwaffe aircraft, the British ship and its escort returned safely to their Cornish bases.



Although not serving in the same numbers as the Beaufighter, the Mosquito was every bit as effective against shipping. Here a U-boat in the Bay receives the treatment from a Mosquito FB.Mk VI.



Hit! A depth charge from a Coastal Command aircraft finds its mark in the Bay of Biscay. The U-boat was lounging on the surface when the pilot spotted it and dropped several charges.

It was such air activity as this that marked the deployment of additional German forces in France not only to protect the U-boat bases but to dispute Coastal Command's increasing anti-submarine operations in the Bay. However, the early metric ASV radar was not proving equal to the task of identifying surfaced U-boats as the presence of French fishing vessels in the Bay showed up on the screens with much the same effect as a conning tower. In January 1943, therefore, Consolidated Liberators began operating ASV Mk III which, originating from an American centimetric AI radar, was able to provide better definition of surface objects.

The increasing success in attacking surfaced U-boats, scarce though these attacks were, led to a new phase in the submarine war by the beginning of 1943, when enemy captains chose to remain surfaced and fight it out with the aircraft, and once more casualties among Coastal Command aircraft (which were forced to attack from low level) began to climb steadily. This was a disturbing turn of events, for statistics prepared at the time suggested that of every hundred or so sightings of enemy submarines fewer than half were attacked, and no more than one or two boats were confirmed as sunk. And while 1942 had brought transformation to the equipment available to fight the U-boat, the Battle of the Atlantic would have to be won in 1943 if the build-up of forces in the UK for the invasion of Europe was to be sustained, a view forcibly expressed at the Casablanca conference early that year. Agreement with the Americans over operational priorities proved difficult, and although they promised to provide six anti-shipping/submarine Liberator squadrons, only three arrived and then too late to make any significant contribution to the Battle of the Bay. Yet, paradoxically it fell largely to the Liberator (with RAF Coastal Command) to win the battle.

In mid-1943 U-boats began operating in packs and were escorted through the Bay by relays of Ju 88C night-fighters. In June no more than 57 submarine sightings were reported, and only two were sunk by aircraft. The German boats then started hugging the Spanish coast to leave the Bay, a course that placed them out of range of all but the Liberator, and when the Royal Navy stepped up its surface patrols the Luftwaffe countered by introducing the Henschel Hs 293A rocket-propelled guided missile, launched by the Do 217s of KG 100. By August, however, the tide had turned. Growing experience with ASV Mk III was producing good results and night attacks on U-boats were shredding the nerves of their crews. In three summer months of 1943 56 U-boats were sunk in the Atlantic, 23 of them in the Bay. It was at this time that the Azores were made available by the Portuguese as a base for Coastal Command aircraft, the first of two U-boats being sunk by Azores-based Liberators in October.

By the end of the year the U-boat menace was being mastered. Allied shipping losses, which had stood at a monthly total of more than half a million tons in mid-1942, fell to an average of about 130,000 tons per month in the latter half of 1943. As the invasion of France approached, so the patrols over the Bay by Coastal Command tightened the blockade against the U-boat. By the date of the Normandy landings no enemy submarine could possibly approach the invasion area from the Biscay bases without almost certain destruction, and scarcely any did. Within three months western France had been cleared of the enemy and Admiral Doenitz's much depleted U-boat fleet was once more forced back into the confines of the North Sea. The Battle of the Bay had been won.

USA

Consolidated B-24 Liberator

With its long-range performance the **Consolidated B-24 Liberator**, when introduced into service in the maritime reconnaissance role, did more than any other aircraft to turn the tide in the Allies' favour in the long Battle of the Atlantic, effectively 'closing the gap' between the patrol areas of east- and west-based aircraft and thereby denying German U-boats (and surface vessels) a vast tract of ocean in which they had been wholly safe from air attack.

First to use the B-24 in the maritime role, was the RAF whose first **Liberator Mk I** aircraft reached the UK during March 1941 and joined No. 120 Squadron at Nutts Corner, Northern Ireland, in June of that year. These were joined by the **Liberator Mk II** (equivalent to the **B-24C**) in December 1941, and later by the **Liberator Mk III (B-24D)**, these three versions equipping a total of 16 RAF squadrons. Subsequent deliveries to Coastal Command included the **Liberator Mk IV (B-24E), Liberator GR.Mk V (B-24G), Liberator GR.Mk VI (B-24G** and **B-24H)** and **Liberator GR.Mk VIII**. With well over 1,000 Liberators flying with RAF maritime reconnaissance squadron in almost every war theatre, it was to be expected that their achievements should be unsurpassed in the war's ocean struggle. For example, in November 1942 the Liberators of No. 224 Squadron in the Bay of Biscay sank two U-boats which were manoeuvring to attack the troop convoys sailing for the 'Torch' landings, attacks that would otherwise have caused enormous casualties among the troops. In March 1945 Liberators of five RAF squadrons sank seven U-boats in six days. Like other RAF maritime patrol aircraft Liberators were widely equipped with the Leigh Light, and other aircraft were armed with rocket projectiles and batteries of cannon for use against submarines.

In US Navy service the Liberator served as the **PB4Y-1**, 977 such aircraft being delivered. A developed version, the **PB4Y-2 Privateer**, entered service with at least one squadron, VP-24, some PB4Y-2Bs being armed with an ASM-N-2 Bat anti-shipping glide bomb under each wing. Total Privateer production amounted to 736 aircraft.

Specification

Consolidated PBY-1 Liberator

Type: 10-seat maritime patrol bomber

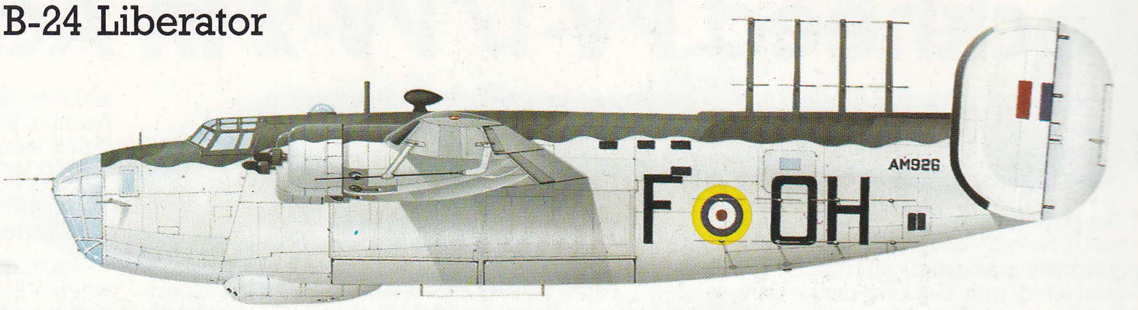
Powerplant: four 1,200-hp (894.8-kW) Pratt & Whitney R-1830-43 or -65 air-cooled radial piston engines

Performance: maximum speed 449 km/h (279 mph) at 8077 m (26,500 ft); climb to 1219 m (4,000 ft) in 7.8 minutes; service ceiling 9693 m (31,800 ft); normal patrol range 4764 km (2,960 miles)

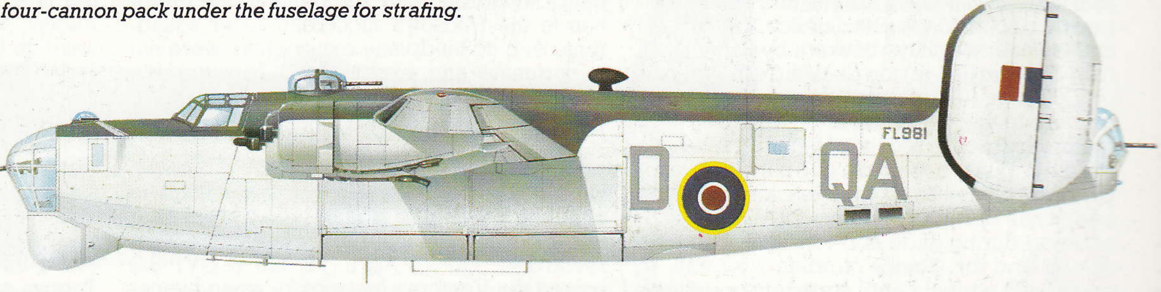
Weights: empty 16761 kg (36,950 lb); maximum take-off 27216 kg (60,000 lb)

Dimensions: span 33.53 m (110 ft 0 in); length 20.50 m (67 ft 3 in); height 5.46 m (17 ft 11 in); wing area 97.36 m^2 (1,048 sq ft)

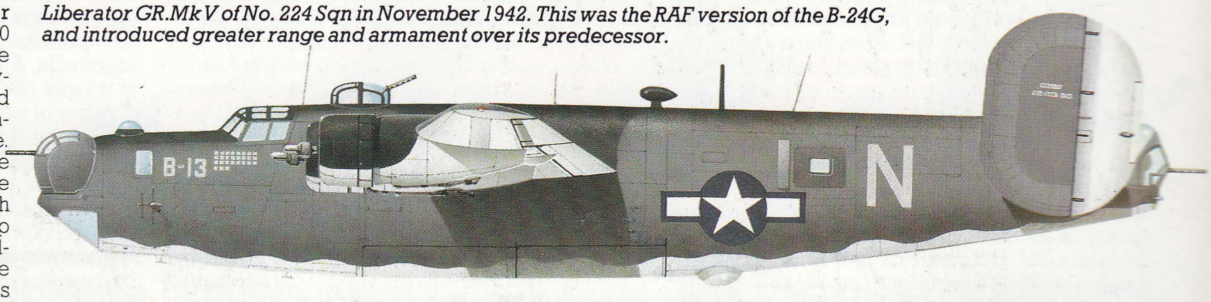
Armament: eight 12.7-mm (0.5-in) machine-guns in nose, dorsal and tail turrets and waist hatches amidships, plus up to 5806 kg (12,800 lb) of bombs, mines or depth charges



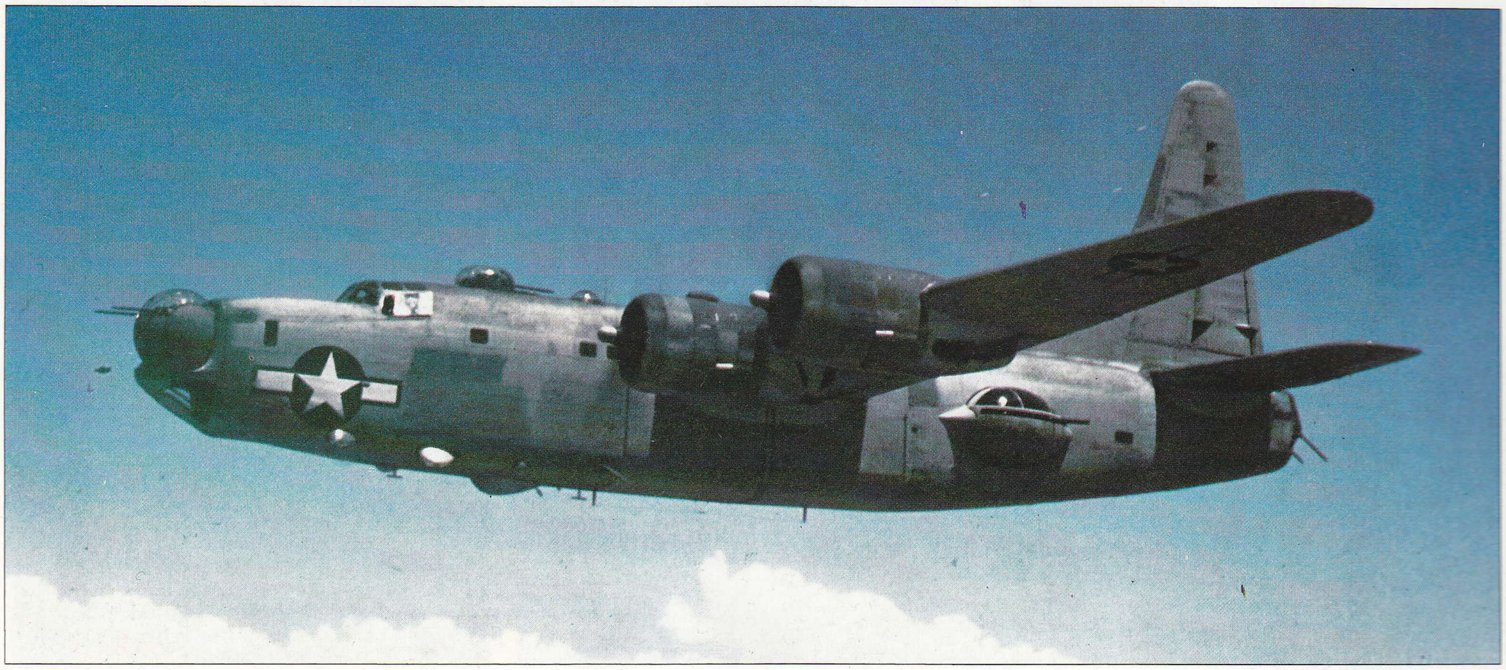
Consolidated Liberator Mk I of No. 120 Sqn flying from Nutt's Corner in 1941. It carries a four-cannon pack under the fuselage for strafing.



Liberator GR.Mk V of No. 224 Sqn in November 1942. This was the RAF version of the B-24G, and introduced greater range and armament over its predecessor.



PB4Y-1 Liberator of VPB-110, US Navy based in Devon, during the winter of 1944. Such US units provided a much-needed back-up to the Coastal Command squadrons.



Arriving in service late in the war, the Consolidated PB4Y-2 Privateer was developed from the Liberator, the main difference being the single fin. These mainly saw action in the Far East and continued in use for many years after the war's end.

Lockheed PV-1/PV-2 in Action

Derived from the civil Model 18, and leading on naturally from the Hudson, Lockheed's Ventura and Harpoon performed sterling work for the US Navy and Royal Air Force on coastal patrols, with the aircraft's strength and performance often overcoming stiff opposition.

The performance and offensive capabilities of the US Navy's Ventura and Harpoon belie their designation as patrol aircraft, a term usually associated with the long-range Consolidated Catalina and Martin Mariner flying-boats. The PVs were fast, heavily armed, and carried impressive bomb loads. For defence, their speed and manoeuvrability, backed by the Martin twin 12.7-mm (0.5-in) top deck turret plus a pair of 7.62-mm (0.3-in) weapons in the belly, proved to be a combination enemy pilots quickly learned to respect. Ventura pilots fired the bow guns, a pair of 12.7-mm guns supplemented later by a 'chin gun' kit with three additional 12.7-mm weapons for AA fire suppression during glide and low-level bombing attacks and for attacks on enemy aircraft. In addition to normal patrol squadron operations (maritime surveillance, anti-submarine patrols and convoy escort), the PVs were regularly called on to exploit their attack capabilities in bombing, rocket and strafing runs on ships and ground installations.

While the PVs were the US Navy's primary land-based patrol aircraft during World War II, the path to their successful operation was a difficult one, especially for the Ventura. Introduced to the fleet in late 1942 and early 1943, the early PV-1 squadrons had little transition training and lost a number of crews and aircraft as a result of this inadequate preparation to cope with the demands of this high-performance aircraft. A 322.3-kg/m^2 (66-lb/sq in)) wing loading, 2,000-hp (1491.4-kW) engines and a minimum single-engine control speed of some 222 km/h (138 mph) were a far cry from the forgiving, 167-km/h (104-mph) PBYs from which most of the crews came. In addition to their inexperience, early Ventura crews were well aware of the poor reputation their aeroplane had acquired earlier during its limited service in the RAF and in the USAF.

On the basis of a successful evaluation of the PBO-1 Hudson by Patrol Squadron 82 (VP-82) during 1941, the US Navy was committed to land-based patrol planes. The Ventura was in production and available, and was a logical choice to fill the requirement. In the event, the US Navy accepted the type for fleet service and also assumed the administration of the contracts with Lockheed. First deliveries to the US Navy were 27 Ventura Mk IIs, requisitioned from British production in September 1942. These aircraft, with RAF equipment installed, were designated PV-3 and were assigned to Patrol Squadron 82. With their Hudson experience behind it, the US Navy's first landplane patrol squadron quickly completed the transition to the Hudson's successor. Later squadrons, with no landplane experience, were not so fortunate and experienced considerable difficulty in adapting to the Ventura.

Atlantic operations against the sub

On completing PV training, VP-82 crews were deployed to Argentia, Newfoundland, to continue the battle against the German U-boats, but not until April 1943 were their efforts rewarded. On 27 April VB-125 (ex-VP-82) scored the Ventura's first victory when Lieutenant Thomas Kinaszczuk sank *U-174* off Newfoundland. The crew, escorting a convoy, was circling ahead of the ships when the pilot sighted a wake about 19.3 km (12 miles) away. Kinaszczuk headed for what he identified as a submarine on the surface and alerted the crew for an attack. At a range of about 2.4 km (1.5 miles) the submarine opened fire, hitting the PV on the starboard wing with what was probably 20-mm explosive shells. Disregarding the damage and the AA fire, the pilot pressed his attack on the crash-diving U-boat and dropped all four 147.4-kg (325-lb) depth bombs close-aboard the submarine's hull. Three of the bombs exploded alongside the boat and the fourth just forward of the bow. As the plane circled, the crew saw the submarine settling. After about two minutes, the bow of the sub surfaced at a steep angle, settling as the boat continued forward at very slow speed. The sub's bow abruptly rose until it was almost vertical, then the U-boat slipped beneath the surface. About two minutes later, there was a violent eruption of air and oil in a huge mushroom on the surface, followed by continuous bubbling until the plane left the area.

US Navy Venturas operating from Caribbean and Brazilian bases fought the Battle of the South Atlantic against the U-boats during 1943 and 1944, when the submarines were at the peak of their capability. VB-127 was credited with the sinking of *U-591* on 30 July 1943 off the coast of Brazil. On 11 August, PV-1s of VB-129 teamed with Liberators from VB-107 and the USS *Moffett* to sink *U-604* in the South Atlantic. The next victim of the ASW forces was *U-615*, sunk in the Caribbean on 6 August by VB-130 Venturas and PBM Mariners from VP-204 and 205.

Operations in the Pacific

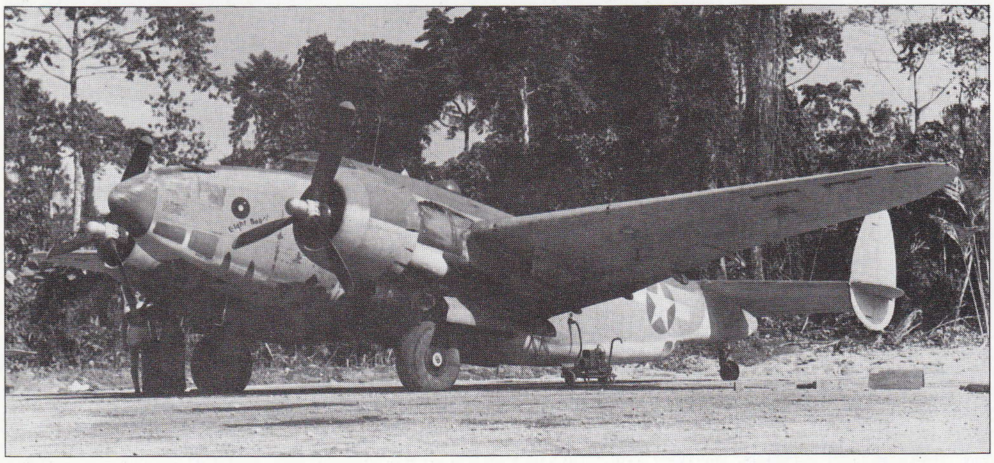
Venturas joined the battle with the Japanese when VB-137 was deployed in May 1943 to Samoa and the Ellice islands, where the squadron flew typical patrol squadron missions. In August, VB-140 pushed PV operations westward, to the Solomons, and began flying from fabled Henderson Field. As the war moved to the west, the squadron moved to the Russells where it was joined by VB-138 in October. The two squadrons pioneered strike tactics there that would be employed by Ventura squadrons for the remainder of the war.

In late 1943 combat activity shifted to the Central Pacific with the landings on Tarawa. The PVs followed, with VB-142 arriving on Tarawa on 21 December, just one month after the landings by the US Marines. The squadron flew patrols and strikes on enemy bases in the Marshalls. Attacks against convoys attempting to supply the bases resulted in 11 ships and a number of small craft sunk or heavily damaged during the first months of the new year. On 12 January 1944 VB-144 arrived on Tarawa to share the responsibilities for maintaining pressure on the enemy. Following the US landings on Kwajalein and Majuro, the two PV squadrons concentrated on neutralizing the bypassed enemy bases in the Marshalls. The threat of raids by enemy bombers staging through the islands was significant, and frequent attacks on the runways and facilities were made to assure their continued neutralization.

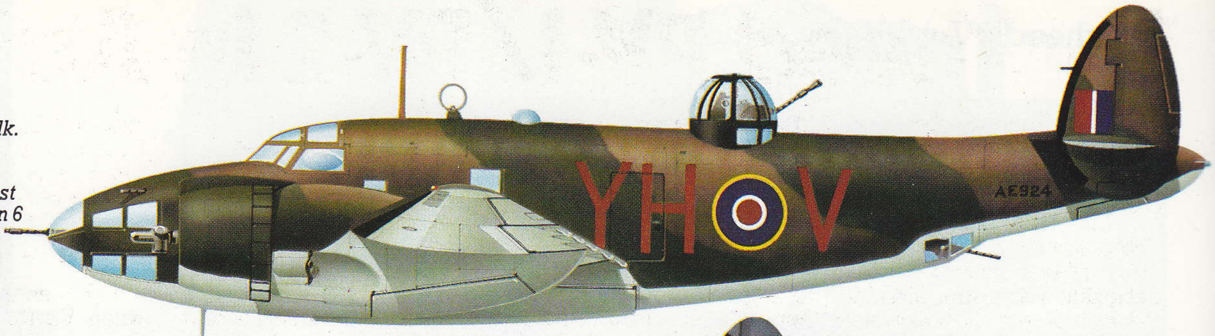
Tactics employed by the Venturas usually were glide bombing runs by formations of three or six aircraft in line abreast, all releasing bombs in train. The formation approached the target at 1829 to 2438 m (6,000 to 8,000 ft) altitude, pushing over into a 30° to 45° dive with speeds reaching as much as 556 km/h (345 mph) indicated. The pilot released the bombs, usually six 227 kg (500 lb) sighting through the ring and bead sight mounted in front of the windshield. Pullout was completed at 914 to 1524 m (3,000 to 5,000 ft) to avoid exposure to automatic weapons fire.

Low-level bombing or photo flights required a high speed pass over the target at 30.5 m (100 ft) or less and planes were hit frequently by automatic weapon fire. A VB-144 Ventura was hit during such a run over Wotje. A single projectile came through the nose of the plane and exploded in the cockpit, killing the pilot instantly and demolishing his controls. The copilot took over and completed the run, then flew the PV back to Tarawa for a safe landing. His feat was remarkable in that he was a replacement pilot who had just joined the squadron and this was his first landing in a Ventura!

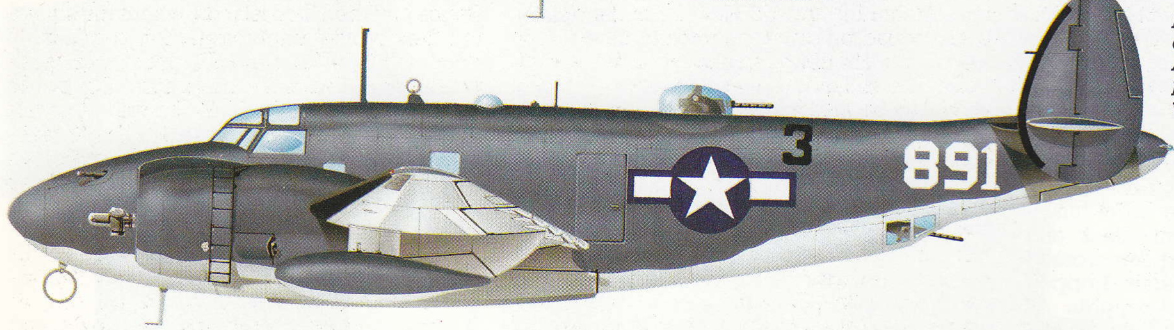
In the South Pacific, the island-hopping campaign continued to move the war to the west. VB-148 was at Munda in New Georgia in April, then moved forward to Emirau late in May. On 1 June 1944, Lieutenant Metke was assigned a search sector near the Western Carolines.



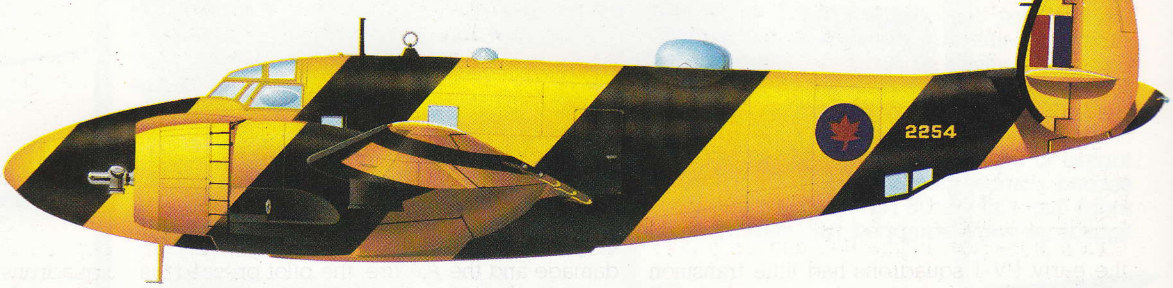
Ready to go; a US Navy PV-1 Ventura waits for its crew at Bougainville in the Solomons. When they were on board, they could look forward to a long, arduous patrol of many hours.



Ventura Mk II of No. 21 Sqn, RAF, operating from Methwold in Norfolk. Venturas entered service with the RAF in November 1942, and one of their first large missions was against the Philips concern at Eindhoven on 6 December. Venturas suffered high losses while used as bombers.



Lockheed PV-1 of VB-135, US Navy, operational over the Pacific in 1944. Approximately 1,600 PV-1s were procured by the Navy during the war.



The end of hostilities was not the end of the Ventura, and some continued in service for many years. This example was flown as a target tug by the Royal Canadian Air Force in the 1950s. Others were converted into executive business transports.

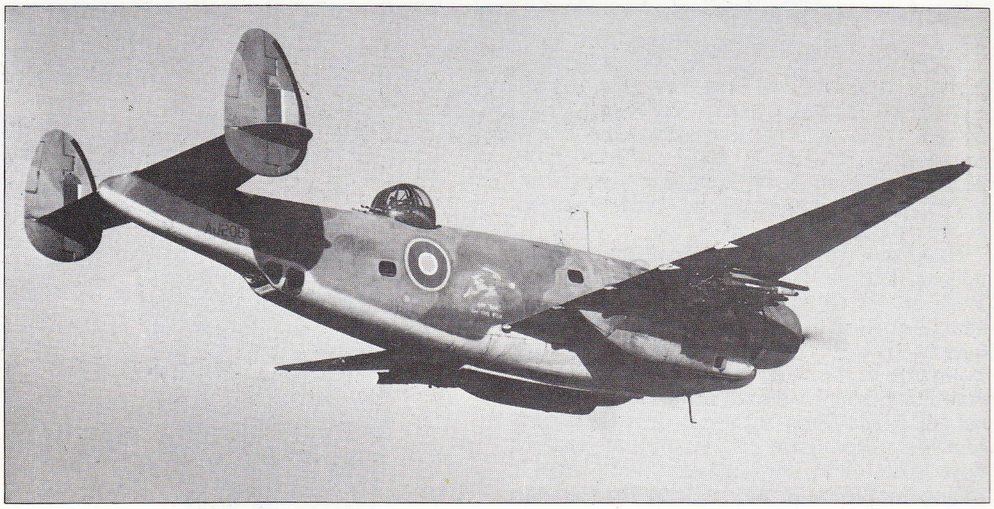
South of the major enemy base at Truk, the crew sighted and engaged a Mitsubishi G4M 'Betty' bomber, shooting it down. A week later, Lieutenant Harry Stanford scored, shooting another 'Betty' down with the PV's bow guns. For variety, on 26 July Lieutenant Metke spotted a five-ship convoy south west of Truk and attacked it with the only weapons he had, namely depth bombs. His contact report alerted the squadron and a six-plane strike was launched which destroyed three of the ships and damaged a fourth. Next day, another strike sank a fourth ship and turret gunner Leonard Wheatley, in one of the attacking Venturas, shot down a Kawasaki Ki-61 'Tony' fighter flying cover for the ships.

Reoccupation of the Marianas later in 1944 provided new bases and marked the high point of Pacific theatre PV operations. Routine search flights were supplemented by frequent strikes on enemy island bases. In early 1945, the PVs began strikes against Japanese picket boats stationed south of the home islands to provide early warning of incoming Boeing B-29 raids. During one such attack by a VPB-133 Ventura, both pilots were seriously injured by AA fire from the target boat. The aircraft crew provided first aid to the pilots, then succeeded in flying the PV back to Iwo Jima where the crew chief landed the plane safely!

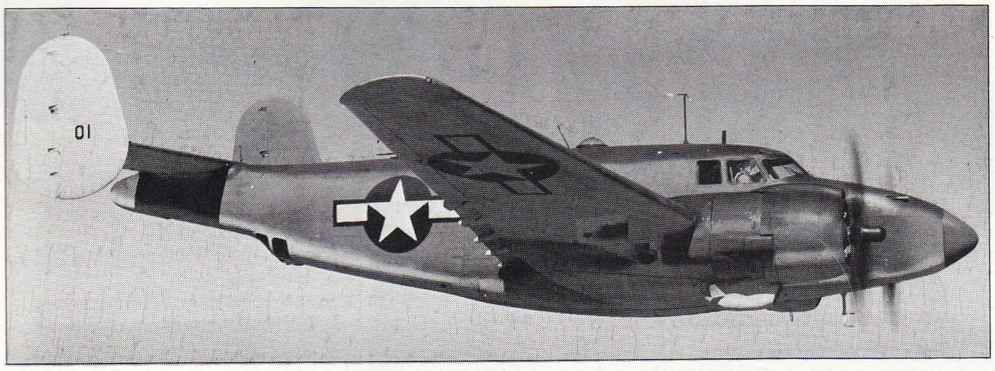
VPB-133 search flights from Iwo Jima included tracks over the home islands, with the opportunity for attacks on coastal shipping, trains, bridges and tunnels. On 13 May, Lieutenant-Commander Jack Coley attacked two ships and destroyed two locomotives with 127-mm (5-in) rockets during a sweep over Honshu. On 28 May Coley found and attacked an eight-ship convoy but was hit by AA fire and was forced to shut down one engine. Damage to fuel tanks eventually forced him to ditch the PV alongside a 'Lifeguard' submarine on station north of Iwo. Coley and all of his crew were rescued, uninjured.

The PV-2 Harpoons first appeared in the Western Pacific when VPB-142 arrived on Tinian in May 1945. On 27 June, on a typical search flight, Lieutenant Janes and his crew had completed the outbound leg of their assigned sector and were turning for home when they passed from a cloud into a clear area

Venturas were active over most of the Pacific theatre on both anti-submarine and anti-shipping duties. At the northernmost range of their activities were the Aleutian Islands, where these aircraft are seen along with a PBY Catalina.



Although used primarily by the RAF as a bomber, the Ventura was used on occasion for maritime duties, especially later on in the war. This example carries unguided rocket projectiles under the wings. The fuselage legend reads 'Got 'em on the run'.



Although arriving late in the war, the PV-2 Harpoon was a much improved aircraft over the PV-1, featuring increased range, withering firepower, manoeuvrability and high speed for a low-level bomber.

and spotted a surfaced Japanese submarine. Janes pushed over in a diving turn and as the PV approached, the submarine crew finally became aware of the imminent attack and started a crash dive. As the Harpoon crossed the target, its deck still awash, Janes dropped three depth bombs for a perfect straddle. As the Harpoon circled, the crew watched the submarine sink in a circle of debris and oil. Post-war analysis of Japanese records confirmed the sinking and identified the boat as the *I-165*.

VPB-144, VPB-148 and VPB-153 also returned to the Western Pacific with PV-2s for second combat deployments. At war's end, more than half the US Navy land-based patrol squadrons were equipped with Harpoons.

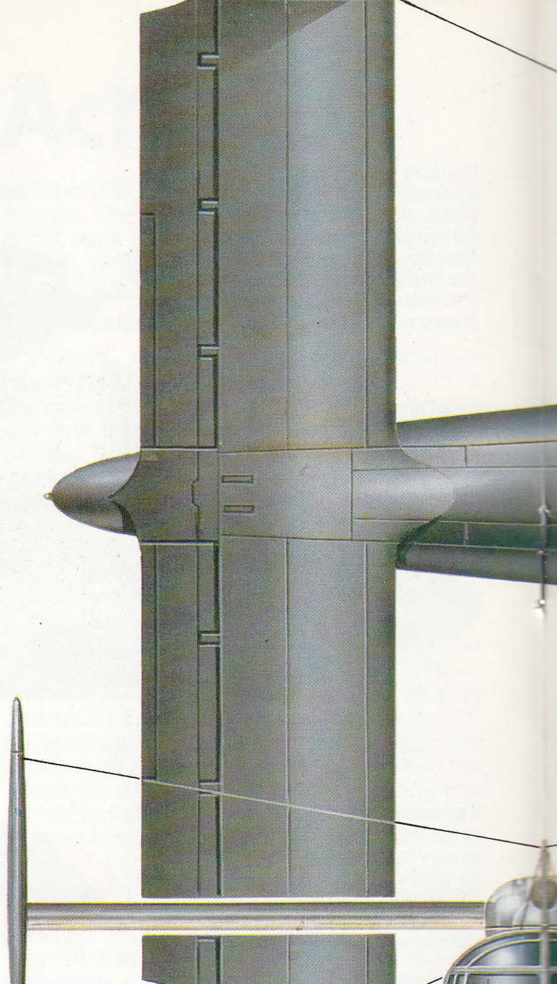
The Aleutians

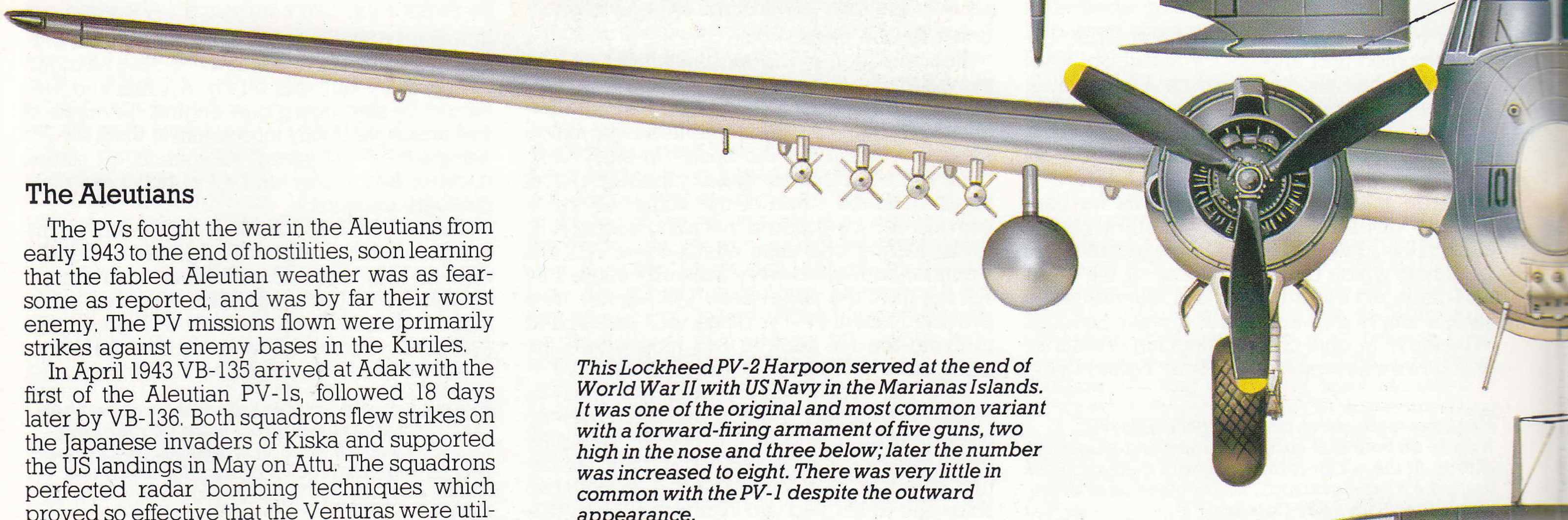
The PVs fought the war in the Aleutians from early 1943 to the end of hostilities, soon learning that the fabled Aleutian weather was as fearsome as reported, and was by far their worst enemy. The PV missions flown were primarily strikes against enemy bases in the Kuriles.

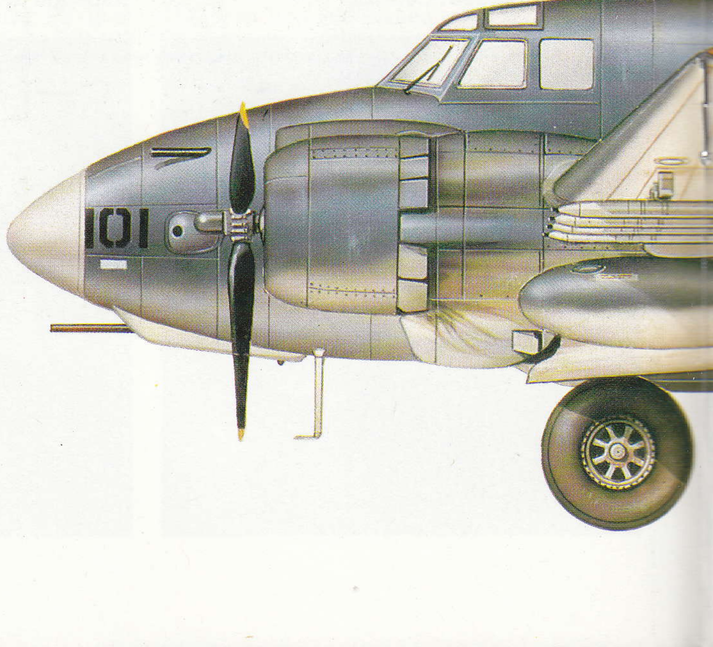
In April 1943 VB-135 arrived at Adak with the first of the Aleutian PV-1s, followed 18 days later by VB-136. Both squadrons flew strikes on the Japanese invaders of Kiska and supported the US landings in May on Attu. The squadrons perfected radar bombing techniques which proved so effective that the Venturas were utilized as pathfinders by US Army Air Force B-24s bombing Kiska through the persistent clouds and fog. The two squadrons were relieved by VB-139 and early in 1944, that squadron pioneered night photo and bombing missions against the Kuriles. By May, VB-139 had completed 78 of these hazardous flights and was relieved by VB-135. In June, a VB-135 crew flew a daylight strike on Shimushu, demonstrating that the missions could be flown more effectively by day.

Harpoons were first deployed to the Aleutians in March 1945 when VPB-139 relieved VPB-136. PV-2s continued rocket and bomb attacks on the Kuriles until war's end in August. One of VB-139's crews scored what must have been one of the most unusual kills of the war when Lieutenant Marlin was attacked by a Mitsubishi A6M3 'Hamp' fighter near Paramushiro. Marlin scored hits on the 'Hamp', then forced it down close to the sea and flew directly over it, rolling the PV from side to side so that his turret gunner could fire. As Marlin pulled ahead of the fighter, the stinger gunner opened up on it for the coup de grace!

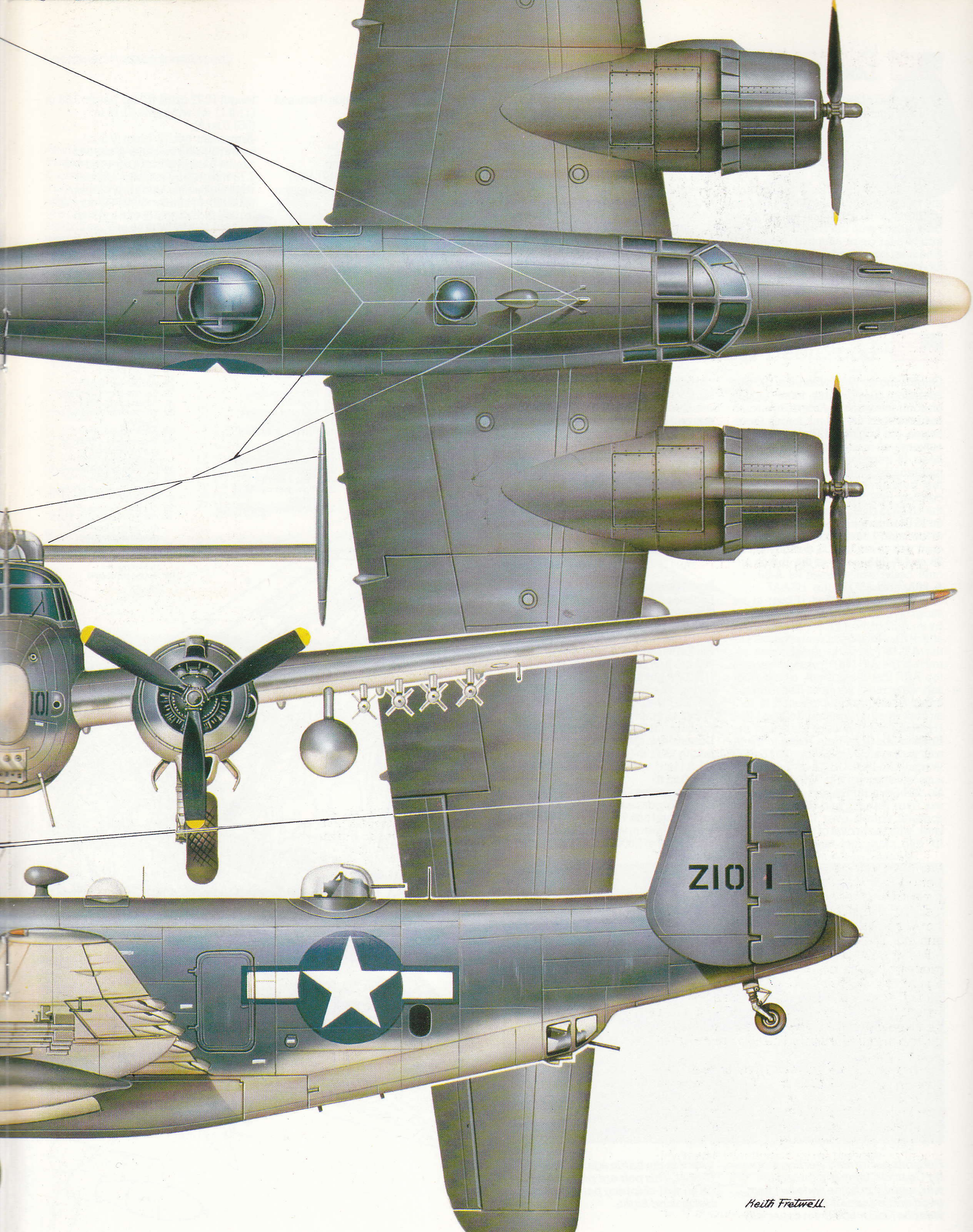
The contribution of the PVs to the final Allied victory in World War II has gone largely unnoticed by historians and the public, and recognition, however belated, is long overdue. The rugged, hard-hitting PVs earned the respect and loyalty of their crews, who knew that the performance and reliability of the plane they flew was their guarantee of a safe return to base.







This Lockheed PV-2 Harpoon served at the end of World War II with US Navy in the Marianas Islands. It was one of the original and most common variant with a forward-firing armament of five guns, two high in the nose and three below; later the number was increased to eight. There was very little in common with the PV-1 despite the outward appearance.


101
Z10 1
Keith Fretwell.

USA

Lockheed PV-1/PV-2 Ventura/Harpoon

The success of the Hudson in RAF service led Lockheed to propose a military version of the larger Lockheed 18 Lodestar and resulting British interest led to development of the **Lockheed 37**. During 1940 a total of 675 of these aircraft was contracted for the RAF, which named the type **Ventura**, and the company lost little time initiating production in the Vega factory. By comparison with the Hudson, the Ventura had far more effective armament, a heavier bombload and more powerful engines, and appeared to have considerable potential. First used operationally by the RAF on 3 November 1942, the type was soon found to be unsuited to daylight operations and was transferred to Coastal Command. Nevertheless, the Ventura was procured in large numbers under Lend-Lease, and was built for the US Army Air Force and US Navy, this last service designating it the **PV-1 Ventura**. Venturas served with all the Commonwealth nations, the Free French and with the Brazilian air force. A long-range version, the **PV-2**, had been ordered by the US Navy in June 1943 and, differing in several respects from the Ventura, was named **Harpoon**; Ventura and Harpoon production totalled 3,028 in September 1945. Post-war surplus PV-2 aircraft were supplied to Italy, Japan, the Netherlands, Peru and Portugal.

Specification

Lockheed PV-1 Ventura
Type: maritime patrol aircraft
Powerplant: two 2,000-hp (1491-kW) Pratt & Whitney R-2800-31 radial piston engines
Performance: maximum speed 518 km/h (322 mph) at 4205 m (13,800 ft); service ceiling 8015 m (26,300 ft); normal range 2189 km (1,360 miles)
Weights: empty 9161 kg (20,197 lb); maximum take-off 14096 kg (31,077 lb)
Dimensions: span 19.96 m (65 ft 6 in); length 15.77 m (51 ft 9 in); height 3.63 m (11 ft 11 in); wing area 51.19 m^2 (551.0 sq ft)
Armament: two 12.7-mm (0.5-in) forward-firing machine-guns, two similar guns in dorsal turret and two 7.72-mm (0.3-in) machine-guns in ventral position, plus up to 1361 kg (3,000 lb) of bombs, or six 147-kg (325-lb) depth charges, or one torpedo

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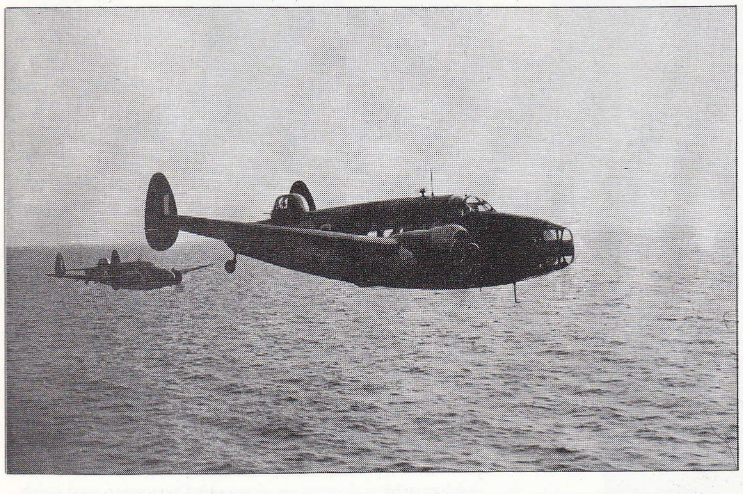
USA

Lockheed Hudson (A-28/-29)

Originating in 1938, when the UK was spending considerably more money on contracts with the American aircraft industry than the US air forces themselves, the **Lockheed Hudson** was the outcome of a request that the Lockheed 14 transport be developed as a maritime reconnaissance aircraft. The first such aircraft was flown on 10 December 1938, and the first to arrive in the UK was disembarked at Liverpool on 15 February 1939. After the initiation of the Lend-Lease programme the aircraft was given the US designation **A-28** and **A-28A**, some of the British aircraft being repossessed as **A-29** and **A-29A** aircraft by the USAAF after Pearl Harbor. The first U-boat to be sunk by American forces was attacked by an A-29 of the 13th Bomb Group. An attack trainer version was produced as the **AT-18** (or, with dorsal turret removed, the **AT-18B**). It was however in the RAF that the aircraft, as the Hudson, saw most service. The original order for 200 (soon increased to 350) aircraft were designated **Hudson Mk I**; Hydromatic propellers identified the **Hudson Mk II**, and the **Hudson Mk III** was powered by 1,200-hp (984.8-kW) Wright GR-1820 G205A radials. Hudsons entered service with the RAF's No. 224 Squadron in mid-1939, replacing Avro Ansons, and thereafter flew constant patrols over the North Sea; later, with the arrival of the Hudson Mk III with extra fuel tanks, the aircraft participated in the Battle of the Atlantic. It was the crew of a No. 269 Squadron Hudson to whom the U-boat *U-570* surrendered after a determined attack on 27 August 1941. A total of 2,487 Hudsons was purchased on British contracts, of which 423 were supplied to Canada, South Africa, China, New Zealand, Australia and Portugal. Final versions were the **Hudson Mks IV, V** and **VI** with Pratt & Whitney radials. Hudsons equipped 31 RAF squadrons, serving as transports in the final years of the war.

Specification

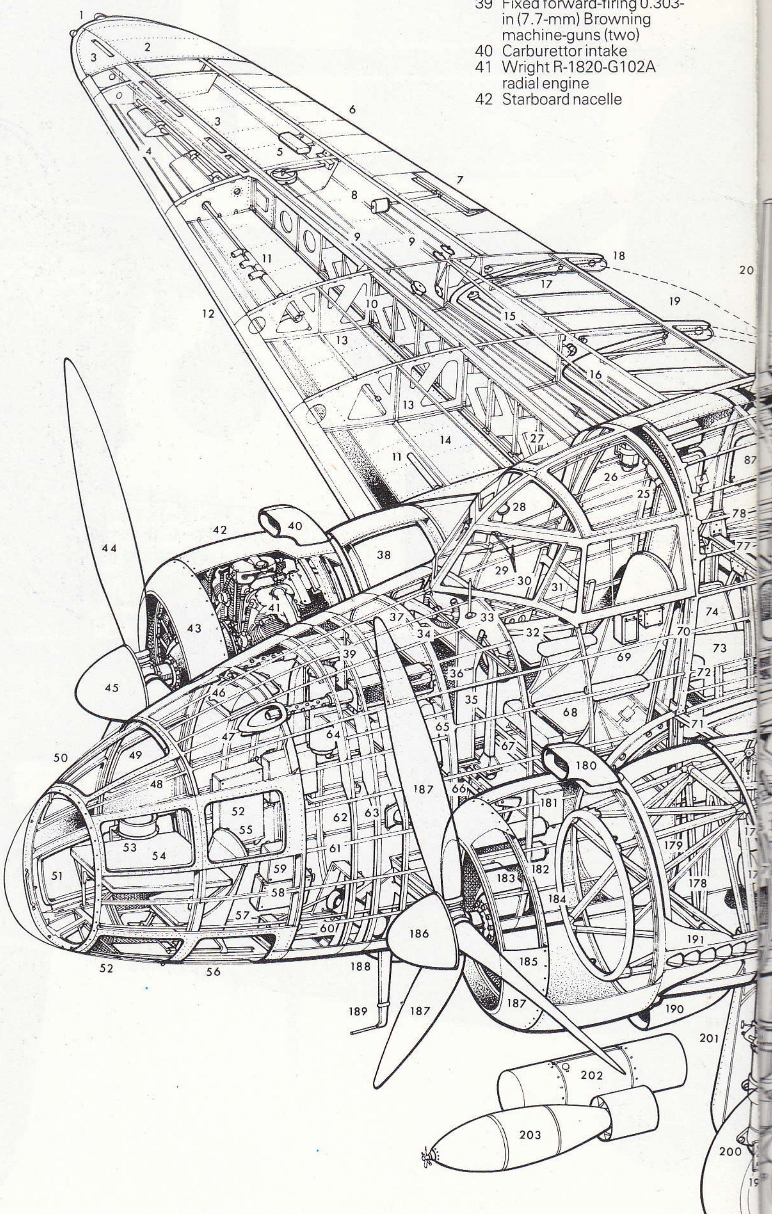
Lockheed A-29 (Hudson Mk IIIA)
Type: four-seat light bomber
Powerplant: two 1,200-hp (894.8-kW) Wright R-1820-87 radial piston engines
Performance: maximum speed 407 km/h (253 mph) at 4572 m (15,000 ft); climb to 3048 m (10,000 ft) in 6.3 minutes; service ceiling 8077 m (26,500 ft); range 2494 km (1,550 miles)
Weights: empty 5817 kg (12,825 lb); maximum take-off 9299 kg (20,500 lb)
Dimensions: span 19.96 m (65 ft 6 in); length 13.51 m (44 ft 4 in); height 3.63 m (11 ft 11 in); wing area 51.19 m^2 (551.0 sq ft)
Armament: two 7.62-mm (0.3-in) machine-guns each in nose and dorsal turrets, and one 7.62-mm (0.3-in) machine-gun in vertical position, plus a bombload of 1,600 lb (726 kg)



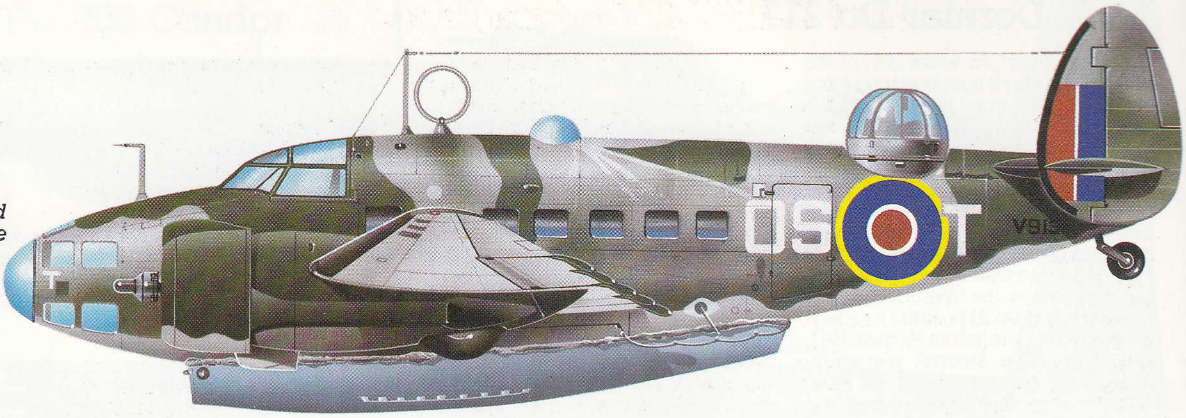
Hudsons performed sterling work for Coastal Command during the war, usually in home waters. Their good endurance and adequate weapon load made them especially useful in the battle against the U-boat. This pair are pictured whilst on an anti-shipping patrol in the Heligoland Bight.

Lockheed Hudson Mk I cutaway drawing key

1 Starboard navigation/identification lights
2 Starboard wingtip
3 De-icing slots
4 Internal vanes
5 Aileron internal mass balance
6 Starboard aileron
7 Aileron tab
8 Tab mechanism
9 Control cables
10 Wing main spar structure
11 De-icing tubes
12 Leading-edge de-icing boot
13 Main wing rib stations
14 Wing skinning
15 Flap control cbles
16 Flap tracks
17 Flap cables/pulleys
18 Track fairings
19 Port flap (extended)
20 Aerial mast
21 D/F loop fairing
22 Supported structure
23 Aerial lead-in
24 Cockpit cold air
25 Flight deck sun-blind frames
26 Windscreen wiper motor
27 Jettisonable canopy hatch
28 Console light
29 Windscreen wipers
30 Second-pilot's jump seat
31 Adjustable quarterlight
32 Windscreen frame support member
33 External gunsight
34 Second-pilot's (back-up) control column (cantilevered)
35 Central instrument console
36 Starboard nose compartment entry tunnel
37 Bulkhead
38 Starboard engine oil tank
39 Fixed forward-firing 0.303-in (7.7-mm) Browning machine-guns (two)
40 Carburettor intake
41 Wright R-1820-G102A radial engine
42 Starboard nacelle

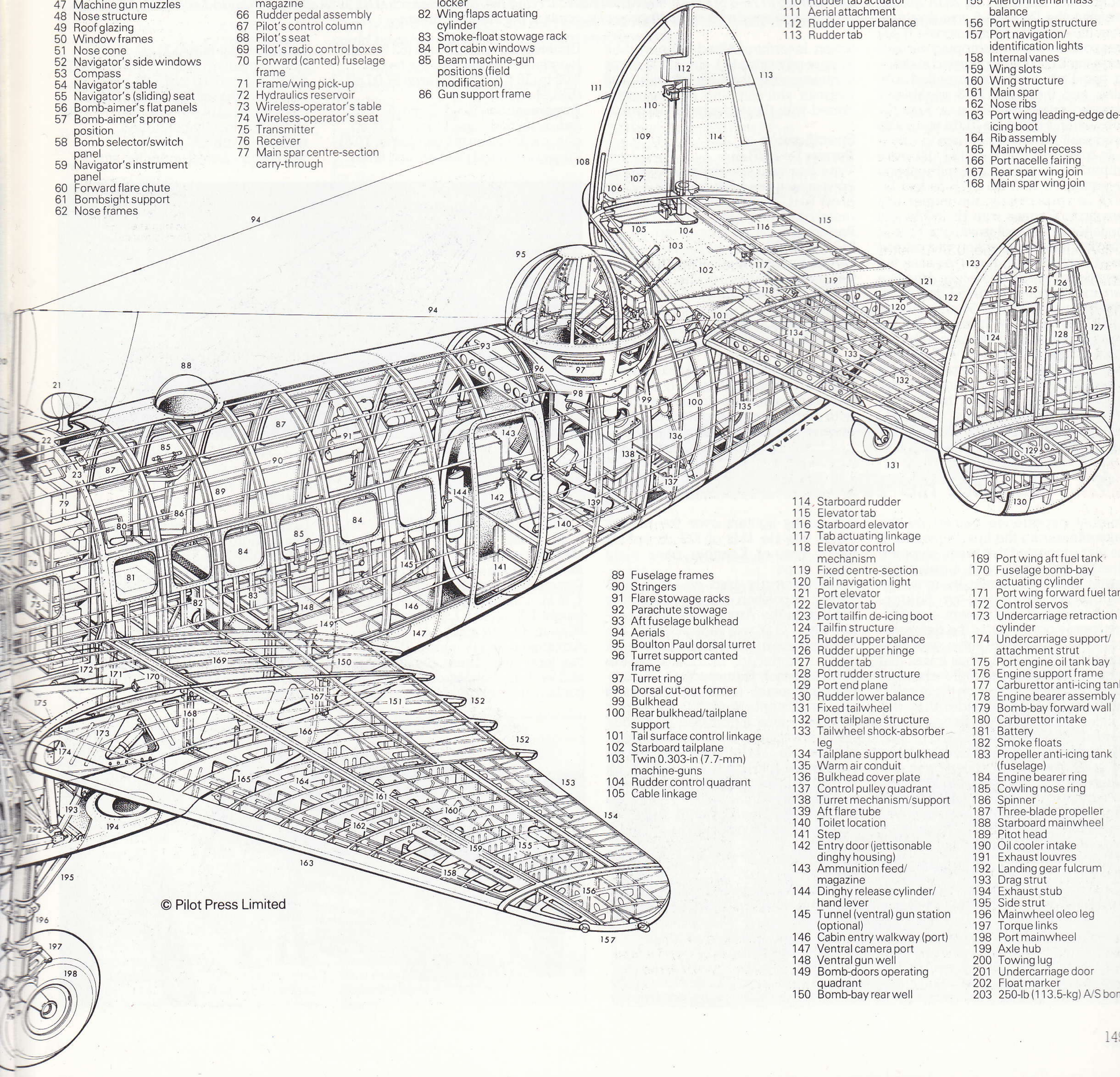


Lockheed Hudson (continued)



Another useful role filled by the Hudson was air-sea rescue. This Hudson Mk III of No. 279 Sqn flew from Sturgate during 1942, equipped with a ventral lifeboat which could be dropped to airmen downed in the North Sea. The aircraft would then signal a ship or flying-boat to come and pick them up.

43 Cowling nose ring
44 Three-blade propeller
45 Spinner
46 Nose compartment cold air
47 Machine gun muzzles
48 Nose structure
49 Roof glazing
50 Window frames
51 Nose cone
52 Navigator's side windows
53 Compass
54 Navigator's table
55 Navigator's (sliding) seat
56 Bomb-aimer's flat panels
57 Bomb-aimer's prone position
58 Bomb selector/switch panel
59 Navigator's instrument panel
60 Forward flare chute
61 Bombsight support
62 Nose frames
63 Nose compartment warm air
64 Windscreen de-icing tank
65 Machine gun ammunition magazine
66 Rudder pedal assembly
67 Pilot's control column
68 Pilot's seat
69 Pilot's radio control boxes
70 Forward (canted) fuselage frame
71 Frame/wing pick-up
72 Hydraulics reservoir
73 Wireless-operator's table
74 Wireless-operator's seat
75 Transmitter
76 Receiver
77 Main spar centre-section carry-through
78 Spar/frame attachment
79 Wireless bay racks
80 Cabin cold air
81 Astrograph table/supply locker
82 Wing flaps actuating cylinder
83 Smoke-float stowage rack
84 Port cabin windows
85 Beam machine-gun positions (field modification)
86 Gun support frame
87 Starboard cabin windows
88 Astrodrome (Mk III and retrofit)
106 De-icing tube
107 Starboard end plane
108 Tailfin de-icing boot
109 Tailfin skinning
110 Rudder tab actuator
111 Aerial attachment
112 Rudder upper balance
113 Rudder tab
151 Port flap section
152 Flap track fairings
153 Aileron tab
154 Port aileron
155 Aileron internal mass balance
156 Port wingtip structure
157 Port navigation/identification lights
158 Internal vanes
159 Wing slots
160 Wing structure
161 Main spar
162 Nose ribs
163 Port wing leading-edge de-icing boot
164 Rib assembly
165 Mainwheel recess
166 Port nacelle fairing
167 Rear spar wing join
168 Main spar wing join

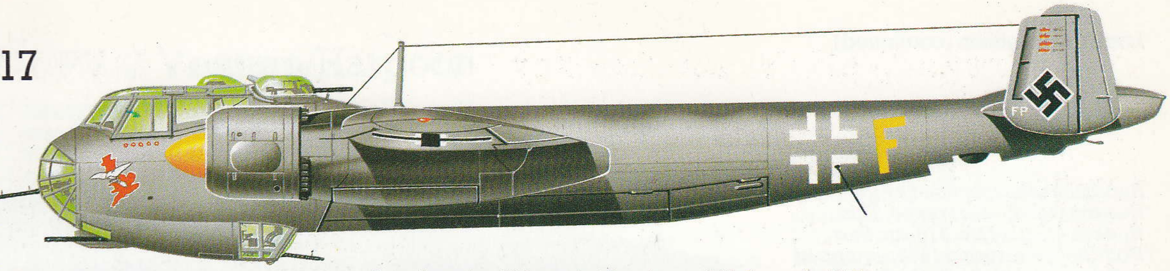


© Pilot Press Limited

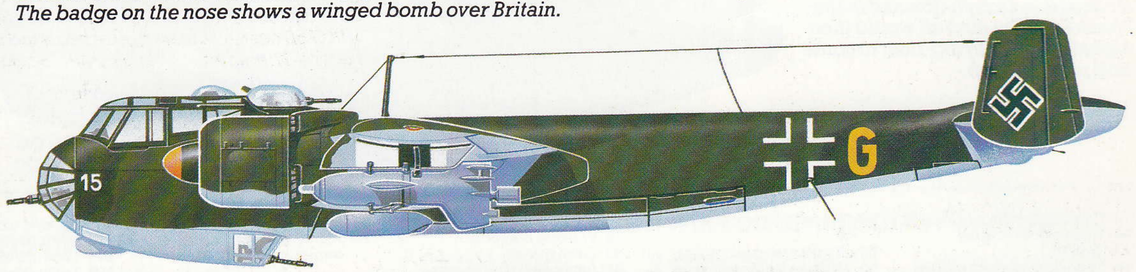
89 Fuselage frames
90 Stringers
91 Flare stowage racks
92 Parachute stowage
93 Aft fuselage bulkhead
94 Aerials
95 Boulton Paul dorsal turret
96 Turret support canted frame
97 Turret ring
98 Dorsal cut-out former
99 Bulkhead
100 Rear bulkhead/tailplane support
101 Tail surface control linkage
102 Starboard tailplane
103 Twin 0.303-in (7.7-mm) machine-guns
104 Rudder control quadrant
105 Cable linkage
114 Starboard rudder
115 Elevator tab
116 Starboard elevator
117 Tab actuating linkage
118 Elevator control mechanism
119 Fixed centre-section
120 Tail navigation light
121 Port elevator
122 Elevator tab
123 Port tailfin de-icing boot
124 Tailfin structure
125 Rudder upper balance
126 Rudder upper hinge
127 Rudder tab
128 Port rudder structure
129 Port end plane
130 Rudder lower balance
131 Fixed tailwheel
132 Port tailplane structure
133 Tailwheel shock-absorber leg
134 Tailplane support bulkhead
135 Warm air conduit
136 Bulkhead cover plate
137 Control pulley quadrant
138 Turret mechanism/support
139 Aft flare tube
140 Toilet location
141 Step
142 Entry door (jettisonable dinghy housing)
143 Ammunition feed/magazine
144 Dinghy release cylinder/hand lever
145 Tunnel (ventral) gun station (optional)
146 Cabin entry walkway (port)
147 Ventral camera port
148 Ventral gun well
149 Bomb-doors operating quadrant
150 Bomb-bay rear well
169 Port wing aft fuel tank
170 Fuselage bomb-bay actuating cylinder
171 Port wing forward fuel tank
172 Control servos
173 Undercarriage retraction cylinder
174 Undercarriage support/attachment strut
175 Port engine oil tank bay
176 Engine support frame
177 Carburettor anti-icing tank
178 Engine bearer assembly
179 Bomb-bay forward wall
180 Carburettor intake
181 Battery
182 Smoke floats
183 Propeller anti-icing tank (fuselage)
184 Engine bearer ring
185 Cowling nose ring
186 Spinner
187 Three-blade propeller
188 Starboard mainwheel
189 Pitot head
190 Oil cooler intake
191 Exhaust louvres
192 Landing gear fulcrum
193 Drag strut
194 Exhaust stub
195 Side strut
196 Mainwheel oleo leg
197 Torque links
198 Port mainwheel
199 Axle hub
200 Towing lug
201 Undercarriage door
202 Float marker
203 250-lb (113.5-kg) A/S bomb

GERMANY

Dornier Do 217



Dornier Do 217E-2 of 9.Staffel, Kampfgeschwader 40 based at Bordeaux-Mérignac in 1942. The badge on the nose shows a winged bomb over Britain.



Dornier Do 217E-5 of KG 40. This aircraft is carrying two of the Henschel Hs 293A stand-off guided anti-ship missiles, which were used with some degree of success in the Mediterranean.

After the departure eastwards of the bulk of Germany's light bombing force from western Europe in May 1941, the principal bomber unit remaining in the Netherlands was Kampfgeschwader 2. This unit by itself was inadequate to sustain a prolonged bombing campaign against the UK, but was nevertheless re-equipped with a new version of the Do 17, the **Dornier Do 217**. At about the same time the specialist anti-shipping unit in the West, KG 40, received its first Do 217s, II/KG 2 receiving **Do 217E-1** aircraft in August 1941. Although these aircraft were fundamentally standard bombers, concessions were soon forthcoming to suit the aircraft to the anti-shipping role with the issue of *Rüstsätze* (conversion kits); among these were the R-10 and R-15 kits to enable the Do 217E to mount anti-shipping weapons, later to include the Henschel Hs 293A guided missiles; the **Do 217E-5** was designed from the outset to accommodate these weapons. Other anti-shipping variants were the **Do 217K-2** equipped to deliver two Fritz X rocket-propelled missiles, and the **Do 217K-3** capable of carrying either Hs 293As or Fritz Xs. Sub-variants of the **Do 217M** were also produced for the anti-shipping role.

In mid-1943 II and III/KG 100 were withdrawn from the Eastern Front and re-equipped with Do 217E-5s and Do 217K-2s respectively, the former unit moving to Cognac with Hs 293As and the latter to Marseilles with the Fritz X. The first success in action was gained on 27 August when Hs 293As sank the Canadian destroyer HMCS *Athabaskan* and the corvette HMS *Egret* in the Bay of Biscay. In the Mediterranean III/KG 100 sank the Italian battleship *Roma* and damaged the *Italia* with Fritz Xs on 9 September; shortly afterwards Major Bernhard Jope (the pilot who, in a Fw 200, had fatally damaged the *Empress of Britain* back in October 1940) discharged a Fritz X against HMS *Warspite*, putting the battleship out of action. In terms of Allied shipping sunk or severely crippled, the Do 217 was unquestionably the most effective of all German anti-shipping aircraft when armed with these guided weapons.

Specification
Dornier Do 217E-5

Type: four-seat anti-shipping bomber
Powerplant: two 1,580-hp (1178.2-kW) BMW 801C 14-cylinder air-cooled radial piston engines
Performance: maximum speed 515 km/h (320 mph) at 5200 m (17,060 ft); climb to 925 m (3,035 ft) in 4.45 minutes; service ceiling 9000 m (29,528 ft); normal range 2300 km (1,429 miles)
Weights: empty 8855 kg (19,522 lb); maximum take-off 16465 kg (36,299 lb)
Dimensions: span 19.00 m (62 ft 4 in); length 18.20 m (59 ft 8.5 in); height 5.02 m (16 ft 6 in); wing area 57.00 m^2 (613.54 sq ft)
Armament: one fixed 15-mm (0.59-in) gun in the nose, one 13-mm (0.51-in) gun in a dorsal turret, one 13-mm (0.51-in) gun in ventral position, and three trainable 7.92-mm (0.31-in) guns in nose and beam positions (the Do 217E-5/R19 also carried four 7.92-mm/0.31-in) guns in the extreme tail), plus an offensive load of two 1045-kg (2,304-lb) Hs 293A remotely-controlled weapons, with 295-kg (650-lb) warheads, carried under the wings

Another KG 40 Do 217 is loaded with bombs. The camouflage is typical of German maritime paint schemes, with disruptive wave patterns applied over the standard paint.

GERMANY

Heinkel He 111

Combat experience gained by the Luftwaffe during the first 18 months of the war suggested that in anti-shipping attacks the bomb was a relatively wasteful and inaccurate weapon, except when delivered by fighter-bombers and dive-bombers, a conclusion amply borne out as the defensive armament on British ships was progressively increased. Thus it was that early in 1941 the Luftwaffe chose to place greater emphasis on the torpedo (notwithstanding considerable difficulties then being experienced in the German navy with their arming pistols) and, following trials and aircrew training at Grossenbrode in the Baltic and Grosseto in Italy, the **Heinkel He 111H-6**, carrying two 765-kg (1,687-lb) LT F5b torpedoes under the wing roots, was first delivered to I/KG 26 at Grosseto early in 1942. By June that year the whole *Geschwader* had been re-equipped and had moved to Banak and Bardufoss in northern Norway for operations against the Allied North Cape convoys. Until the inclusion of British escort carriers in these convoys, the German torpedo bombers (which also numbered some He 115 floatplanes) achieved outstanding success. Nevertheless, even when confronted by fighters over the convoy PQ.18, the He 111s of KG 26, led by Major Werner Klümper, sank eight Allied ships.

Increasingly bad weather and fighter opposition led to diminishing success in the Arctic, and in November 1942 KG 26 was redeployed to the Mediterranean. New torpedo variants were introduced, including the **He 111H-15** which featured FuG 200 anti-shipping search radar and increased gun armament. *Rüstsätz* conversion kits were also introduced to modify bomber variants to the torpedo role, but the **He 111H-12** variant, which underwent trials with two underwing Henschel Hs 293A anti-shipping weapons in conjunction with FuG 203b Kehl III guidance system, failed to achieve operational status.

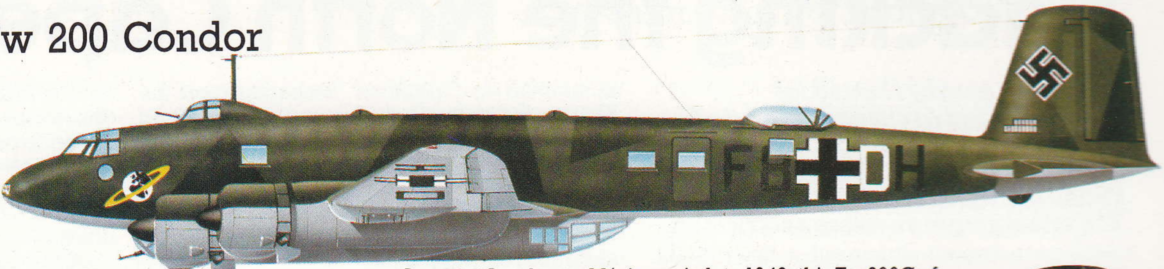
Specification
Heinkel He 111H-6

Type: six-seat torpedo bomber
Powerplant: two 1,400-hp (1044-kW) Junkers Jumo 211F-1 12-cylinder liquid-cooled Vee piston engines
Performance: maximum speed 435 km/h (270 mph) at 6000 m (19,685 ft); climb to 2000 m (6,562 ft) in 8.5 minutes; service ceiling 8500 m (27,887 ft); normal range 1900 km (1,181 miles)
Weights: empty 8690 kg (19,158 lb); maximum take-off 14000 kg (30,864 lb)
Dimensions: span 22.60 m (74 ft 1.75 in); length 16.45 m (53 ft 11.5 in); height 4.00 m (13 ft 1.75 in); wing area 86.50 m^2 (931.07 sq ft)
Armament: six 7.92-mm (0.31-in) machine-guns in nose, dorsal, beam and ventral positions, one 20-mm cannon in the extreme nose, and (some aircraft) a remotely-fired 7.92-mm (0.31-in) gun in the extreme tail, plus an offensive load of either two 1000-kg (2,205-lb) bombs or two 765-kg (1,687-lb) LT F5b torpedoes carried on external PVC racks

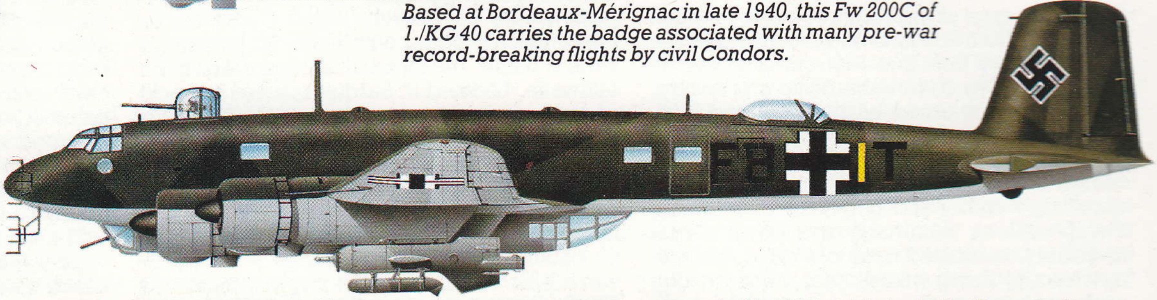
A pair of LT F5b practice torpedoes are loaded on to the underfuselage racks of a Heinkel He 111H-6. The H-6 was also used for trials with guided missiles and glide-bombs.

GERMANY

Focke-Wulf Fw 200 Condor



Based at Bordeaux-Mérignac in late 1940, this Fw 200C of 1./KG 40 carries the badge associated with many pre-war record-breaking flights by civil Condors.



The Fw 200C-6 featured FuG 200 Hohentwiel *radar and the ability to carry the Hs 293A guided missile. Two missiles could be carried under the outboard engine nacelles.*

Famous as a pre-war airliner with a number of formidable long-distance flights and records to its credit, the four-engine **Focke-Wulf Fw 200 Condor** was dsigned by Kurt Tank in 1936, and underwent military adaptation into a fairly potent anti-shipping aircraft with the Luftwaffe. Ten pre-production **Fw-200C-0** maritime reconnaissance aircraft were delivered to the Luftwaffe in September 1939, some of them serving with I/KG 40 in 1940. The five-crew production **Fw 200C-1** was powered by four 830-hp (618.9-kW) BMW 132H engines, was armed with a 20-mm gun in the nose and three 7.92-mm (0.31-in) guns in other positions and could carry four 250-kg (551-lb) bombs. Apart from long-range maritime patrols over the Atlantic, the Fw 200C-1s also undertook extensive minelaying in British waters during 1940, each carrying two 1000-kg (2,205-lb) mines. Numerous subvariants of the C-series appeared, of which the **Fw 200C-3** with 1,000-hp (745.7-kW) Bramo 323R-2 radials was the most important. Later in the war the **Fw 200C-6** and **Fw 200C-8** were produced in an effort to enhance the Condor's operational potential by adaptation to carry two Henschel Hs 293 missiles in conjunction with FuG 203b missile control radio.

Rugged operating conditions highlighted the Fw 200's numerous structural weaknesses and there were numerous accidents in service, and for a short time in the mid-war years Fw 20s were employed as military transports, 18 aircraft being flown by Kampfgruppe zur besonderen Verwendung 200 in support of the beleaguered German forces at Stalingrad. Other Condors were used by Hitler and Himmler as personal transports. Focke-Wulf Fw 200 production for the Luftwaffe amounted to 252 aircraft between 1940 and 1944.

Specification

Focke-Wulf Fw 200C-3/U4

Type: seven-seat long-range maritime reconnaissance bomber

Powerplant: four 1,000-hp (745.7-kW) BMW-Bramo 323R-2 radial piston engines

Performance: maximum speed 360 km/h (224 mph) at 4700 m (15,420 ft); service ceiling 6000 m (19,685 ft); range 3560 km (2,211 miles)

Weights: empty 17000 kg (37,478 lb); maximum take-off 22700 kg (50,044 lb)

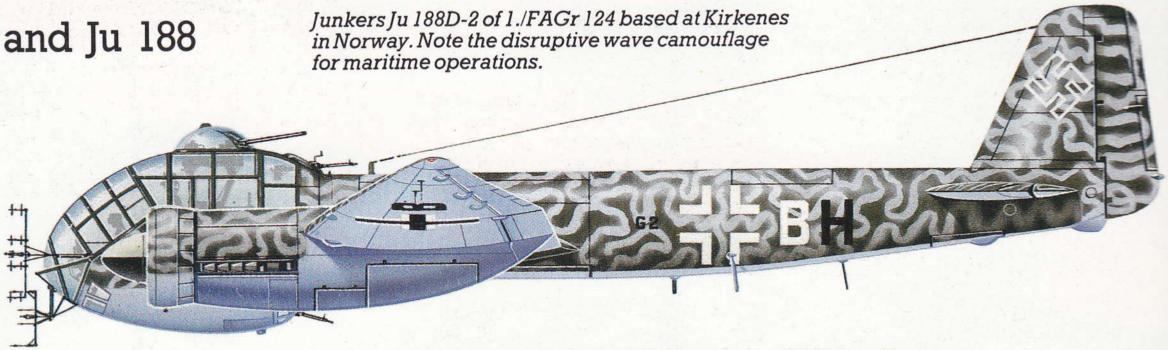
Dimensions: span 32.84 m (107 ft 9.5 in); length 23.85 m (76 ft 11.5 in); height 6.30 m (20 ft 8 in); wing area 118.00 m^2 (1,290.0 sq ft)

Armament: one 7.92-mm (0.31-in) gun in forward dorsal turret, one 13-mm (0.51-in) gun in rear dorsal position, two 13-mm (0.51-in) guns in beam positions, one 20-mm gun in forward position of ventral gondola and one 7.92-mm (0.31-in) gun in aft ventral position, plus a maximum bomb load of 2100 kg (4,630 lb).

GERMANY

Junkers Ju 88 and Ju 188

Junkers Ju 188D-2 of 1./FAGr 124 based at Kirkenes in Norway. Note the disruptive wave camouflage for maritime operations.



Just as the Heinkel He 111 corresponded roughly to the RAF's Vickers Wellington in the maritime role, so the **Junkers Ju 88** was a contemporary of and superficially equivalent to Coastal Command's Bristol Beaufighter. However, whereas the latter was conceived from the outset as a fighter, the Ju 88 was fundamentally a bomber which came to serve as a night-fighter and intruder.

Ju 88s flew anti-shipping missions with specialist *Kampfgeschwader*, notably KG 30, as early as the Norwegian campaign of April 1940, although the aircraft themselves were standard **Ju 88A** bombers. And it was KG 30's Ju 88s that were flown with such devastating success against British shipping during the Greek campaign of 1941. In an attack by 7./KG 30 on the approaches to Piraeus harbour Hauptmann Hajo Herrmann's bombs struck the freighter *Clan Frazer* which was loaded with explosives and blew up, destroying 10 other ships. Soon afterwards KG 30 was assembled in northern Norway for attacks against the North Cape (PQ) convoys being sailed between Iceland and Soviet ports.

Although no version of the Ju 88 was developed specifically for the anti-shipping strike role, the extensively redesigned **Junkers Ju 188**, which began making real progress before the end of 1942, appeared in several versions as a torpedo bomber. The first, the **Ju 188E-2**, could carry two 800-kg (1,764-lb) torpedoes under the wings and some aircraft also carried FuG 200 sea-search radar. This version and another, the **Ju 188A-3** with water methanol boosted engines, served in small numbers with the anti-shipping unit III/KG 26 towards the end of 1944.

The Ju 188 was a popular aircraft with its crew but, following the switch of priorities by the Germans in favour of fighters in the latter half of 1944, production of the bomber and torpedo bomber versions was halted, although they remained in fast-diminishing service until the end of the war.

Specification

Junkers Ju 188E-2

Type: four-seat torpedo bomber

Powerplant: two 1,700-hp (1267.7-kW) BMW 801D air-cooled radial piston engines

Performance: maximum speed 500 km/h (311 mph) at 6000 m (19,685 ft); climb to 6000 m (19,685 ft) in 17.6 minutes;service ceiling 9300 m (30,512 ft); normal range 1950 km (1,212 miles)

Weights: empty 9860 kg (21,737 lb); maximum take-off 14470 kg (31,898 lb)

Dimensions: span 22.00 m (72 ft 2 in); length 14.90 m (48 ft 0.5 in); height 4.44 m (14 ft 6.8 in); wing area 56.00 m^2 (602.78 sq ft)

Armament: gun armament (commonly) of two 13-mm (0.51-in) machine-guns in nose and dorsal positions, plus an offensive load of up to 3000 kg (6,614 lb) or two 800-kg (1,764-lb) LT lb torpedoes carried under the wings.

The superlative Ju 88 was effective in many roles, and anti-shipping was no exception. This aircraft bears 10 ship kills from the Mediterranean, denoted by the fuselage theatre band.

Attacking the North Cape Convoys

The British convoys bound for Murmansk and Archangel'sk loaded with British aid to help the Soviet war effort were a natural and inviting target for the Luftwaffe's bombers in Norway. The attacks were* en masse *and vicious.

The entire saga of the series of convoys which was sailed from Scotland and Iceland to Soviet northern ports from late 1941 onwards was an enterprise of incredible hardship and hazard, not only for the crews of the naval and merchant ships that constituted the convoys but also for the Luftwaffe aircrews sent out to search for, shadow and attack them. Apart from appalling weather and long hours of darkness, a ship sunk or an aircraft shot down almost invariably committed men to a rapid death in the freezing Arctic wastes, such were the long odds against rescue.

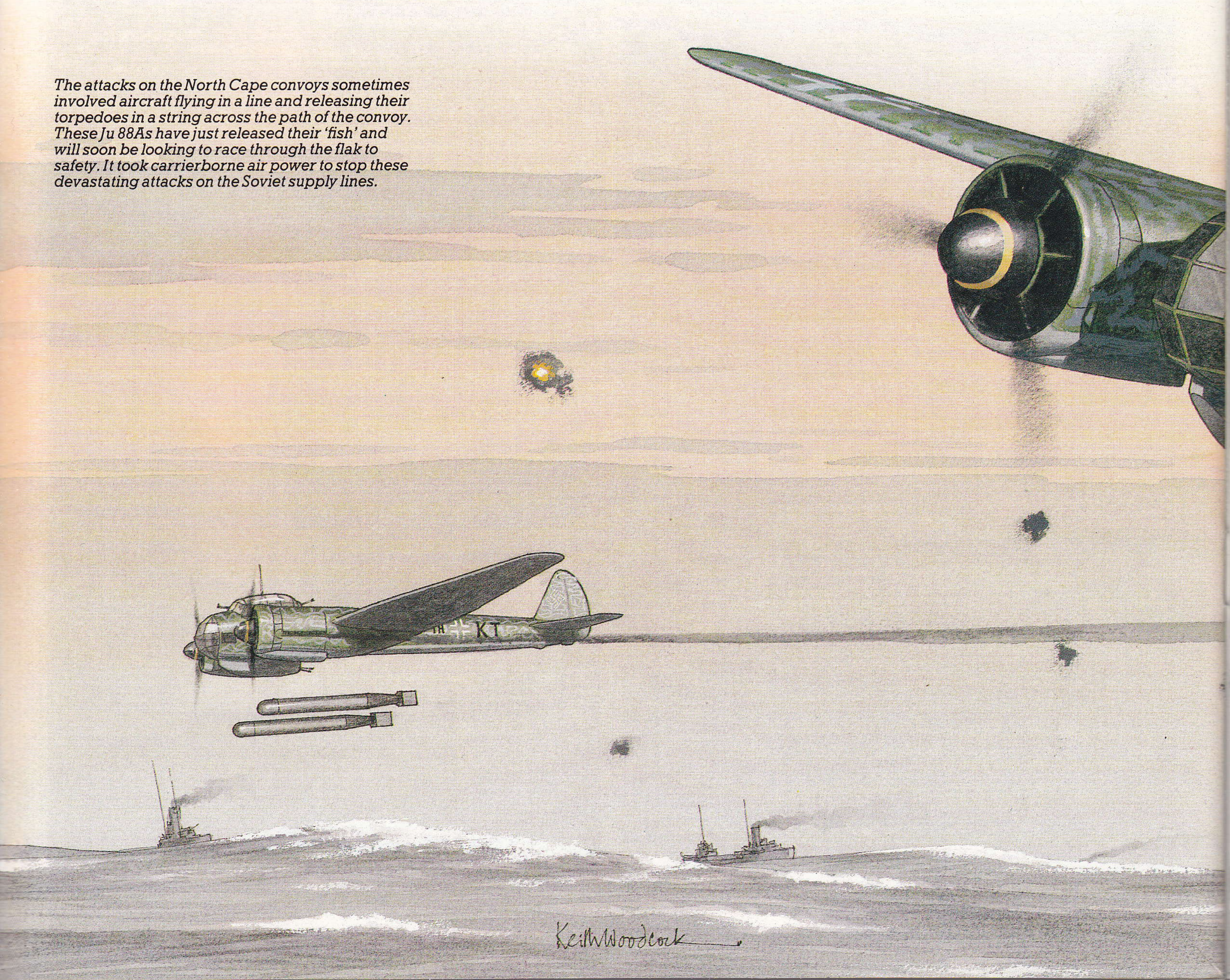
Early convoys (numbered PQ.1 onwards for those bound for Murmansk and Archangel'sk, and QP.1 onwards for those returning westwards) sailed from late in the summer of 1941 with supplies for the Soviet Union following Churchill's pledge of assistance to Stalin, and with much of the Luftwaffe's available strength committed to Operation 'Barbarossa' on the Eastern Front, these early essays encountered little in the way of enemy interference.

By March 1942, however, as significant quantities of US war supplies became available for the Soviet Union, the German air force (Luftflotte V) in northern Norway had undergone considerable strengthening, the whole of Kampfgeschwader 30 by then being based under Major Erich Blödorn with about 80 Junkers Ju 88As at Banak, the forward headquarters of the Luftwaffe. Located at Bardufoss were some 30 of the newly-developed torpedo-carrying Heinkel He 111H-6s of I/KG 26 under Hauptmann Garnot Eicke. Providing long-range reconnaissance and search were a dozen Focke-Wulf Fw 200 Condors of I/KG 40, and half that number of Blohm und Voss Bv 138 flying-boats of 2.Staffel, Küstenfliegergruppe 406. There were also about 30 short-range Junkers Ju 87B/R dive-bombers of I/StG 5. KüFlGr 406's 1.Staffel, commanded by Hauptmann Eberhard Peukert, was based at Sörreisa, near Tromsö, with 11 torpedo-carrying Heinkel He 115C-4s.

Towards the end of March 1942 the convoy PQ-13 was the first to meet with significant air attack when, after some hours of shadowing by an Fw 200, about 20 Ju 88s of III/KG 30, led by the legendary Hauptmann Hajo Herrmann, came in to attack. Hampered by patchy low cloud, the German aircrews were unable to set up co-ordinated bombing runs and only managed to hit and sink two ships with the loss of 55 lives.

A fortnight later PQ.14 set sail from Iceland, but, encountering dense fog and drifting ice floes which would have caused the convoy to reduce speed to no more than about 4 kts, the naval commander judged it prudent to turn back. PQ.15, which sailed five days later, was reported and shadowed by KüFlGr 406, and came under torpedo attack from the He 111s of KG 26, which sank three ships with the loss of nearly 80 lives.

The full might of Luftflotte V was unleashed against the next three convoys. The 34 ships which made up PQ.16 and which had sailed shortly behind PQ.15 were spotted and shadowed at long range by the Fw 200s and Bv 138s. On 25 April, and for five days after, the convoy came under repeated attack by the whole of KG 30 and I/KG 26. Realizing that in the face of such severe attacks the escort was unable to put up adequate gunfire to protect his ships, the convoy commodore ordered the



The attacks on the North Cape convoys sometimes involved aircraft flying in a line and releasing their torpedoes in a string across the path of the convoy. These Ju 88As have just released their 'fish' and will soon be looking to race through the flak to safety. It took carrierborne air power to stop these devastating attacks on the Soviet supply lines.

merchantmen to scatter and, although the Ju 87s joined in the attacks on 30 April, only seven ships were hit and sunk for the loss of 90 lives. Ten German aircraft were claimed destroyed, but these losses were not reflected in Luftwaffe records.

There followed a six-week lull in eastbound sailings, as much to allow merchantmen to return from Soviet ports as to study the best tactics in the face of the heavy German air attacks. The order to scatter had obviously saved PQ.16 from greater slaughter, but it had been acknowledged that weather conditions had been too bad to allow enemy surface ships and submarines to operate. There was now growing evidence that at least four U-boats were on patrol to the north of North Cape, while a powerful flotilla of Germany's potent destroyers were known to be based in Norway. A scattered convoy was almost defenceless against such a threat.

PQ.17 sailed from Icelandic waters on 27 June 1942, in dense fog and covered by a strong naval force which patrolled some four hours' steaming to the west. Ony three days out, the convoy was spotted by the crew of a Vaernes-based Fw 200 of 2./KG 40 and following transmission of its course and speed attacks by He 115s and U-boats developed. In attacks by eight He 115s on 2 July the leading aircraft, flown by Hauptmann Herbert Vater, was forced down by AA fire, but the crew was instantly rescued when Oberleutnant Burmester landed alongside in the treacherous seas. At dawn two days later the He 115s returned and, following a sighting by Hauptmann Eberhard Peukert, a torpedo attack severely damaged the American freighter *Christopher Newport*.

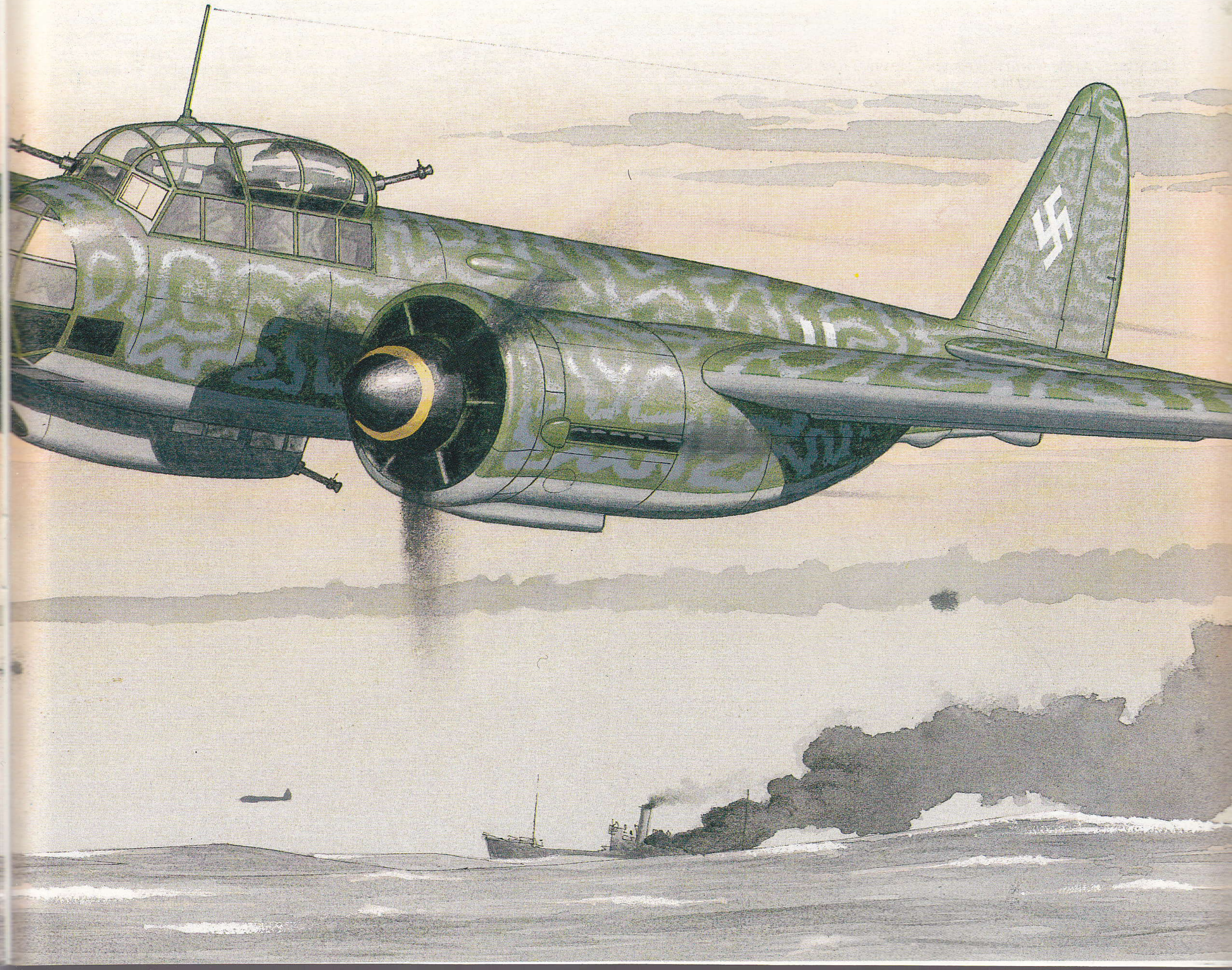
Mass attack

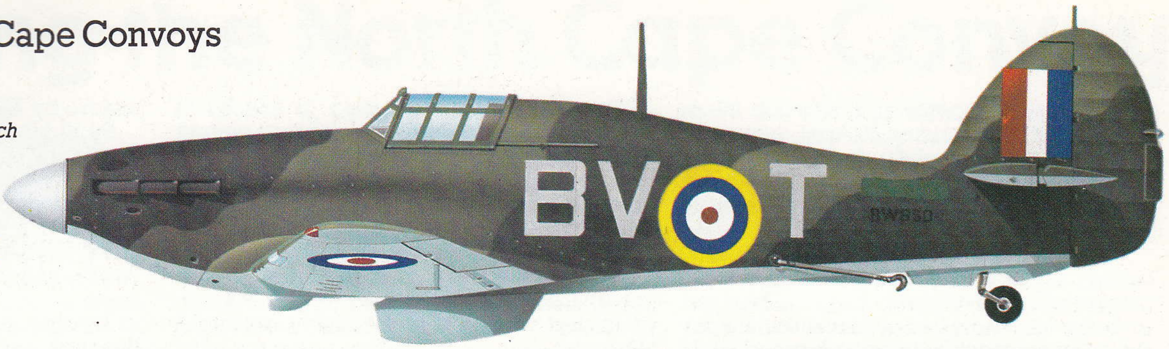
On 5 July the first major attack by the Ju 88s of KG 30 was launched, each column of ships being assigned to a specific *Gruppe* which then attacked in line astern of vics. In quick succession the *Peter Kerr, Washington, Bolton City, Fairfield City* and *Zaafaran* were hit by bombs and sunk. Partly as a result of this savage attack and partly owing to a series of confused signals relating to the possible approach of German surface vessels, the convoy was ordered to scatter. This time, however, the scale of German air surveillance was such that the massacre continued, five further ships being torpedoed by U-boats, while the *El Capitan* and *Hoosier* were badly damaged in air attacks by KG 30 on 10 July.

By 12 July, Luftwaffe patrols having failed to locate any of the ships of PQ.17, the Germans were convinced that the entire convoy had been wiped out, and made claims accordingly. In fact 11 surviving vessels had managed to reach the relative safety of the coast of Novaya Zemlya and in due course struggled into Soviet ports.

The loss of more than 250 merchant seamen, the ships and a considerable quantity of war matériel was an enormous setback for the Allies and one that demanded a serious reappraisal of the efforts being made to get these politically sensitive convoys through to the USSR. Despite the heavy losses thus far suffered, Stalin persisted in his complaints that his Western Allies were simply not trying their hardest to relieve the sufferings and sacrifices of the Soviet people and the sorely-pressed Red Army.

So it was that when PQ.18 sailed from Loch Ewe in Scotland on 2 September 1942 the 42 merchantmen were accompanied by an escort carrier, HMS *Avenger* with three Fairey Swordfish and 12 Hawker Sea Hurricanes of Nos 802 and 883 Squadrons embarked, six cruisers, 24 destroyers, two submarines and 13





The main worry of the attacking aircraft was the Sea Hurricane, which could be launched from merchant carriers (CAM-ships). As the situation in the North worsened for the Allies, an aircraft-carrier with Sea Hurricanes aboard was sent to protect the convoys. Many German aircraft suffered from the guns of these fighters.

smaller naval vessels.

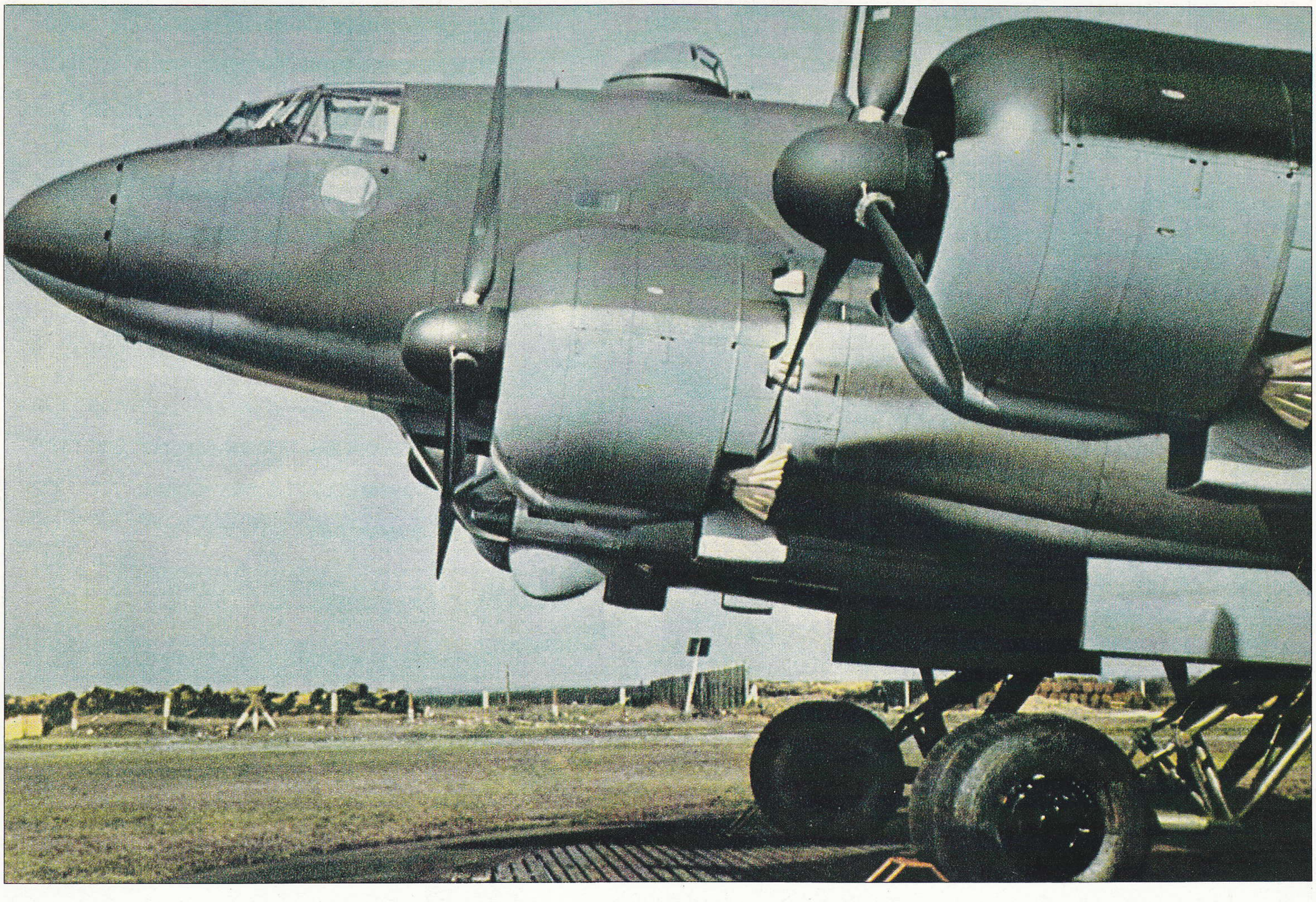
After initial sightings and shadowing by German forces, submarine and air attacks on the convoy started on 12 September when a destroyer sank a U-boat. German submarines then sank two merchantmen early in the following day, but fog, rain and snow prevented attacks by the Luftwaffe until the afternoon; then, as the Sea Hurricanes were engaged in trying to destroy the shadowing Fw 200s, about 100 aircraft (including the entire available force of He 111s, each carrying a pair of torpedoes) attacked at very low level. Eight merchantmen were hit by torpedoes, and all sank.

The carrier commander then changed his orders, sending his fighters against the raiders. During 14 September the *Avenger* herself became the enemy air force's main target but, as her Sea Hurricanes shot down 12 German aircraft (confirmed in Luftwaffe records), the carrier escaped damage from several torpedo and dive-bombing attacks. Later that day further attacks by Ju 87s, Ju 88s and He 111s developed, but the cloudbase was dropping quickly and provided a measure of protection for the ships; nine more German aircraft were destroyed for the loss of three British fighters (their pilots being miraculously rescued), and a single merchantman was hit and blew up.

By 15 September PQ.18 had drawn out of range of German aircraft and as the convoy sailed on, having lost 13 ships (10 to aircraft and three to U-boats), the *Avenger* was ordered to meet and escort a homecoming convoy, which was to lose four ships before it reached home waters.

The losses sustained during the battles of these two convoys cost the Luftwaffe a total of 38 aircraft, including an Fw 200 and a Bv 138; three U-boats were also sunk. On the Allied side 17 merchant ships, with 178 lives, were lost, as were a destroyer, a minesweeper and an oiler. British aircraft losses amounted to four fighters and a flying-boat. A Sea Hurricane, catapulted from the CAM-ship *Empire Morn*, was not, however, lost; having destroyed an enemy flying-boat, the pilot managed to reach a Soviet airfield where he landed safely with 18.2 litres (4 Imp gal) of fuel remaining.

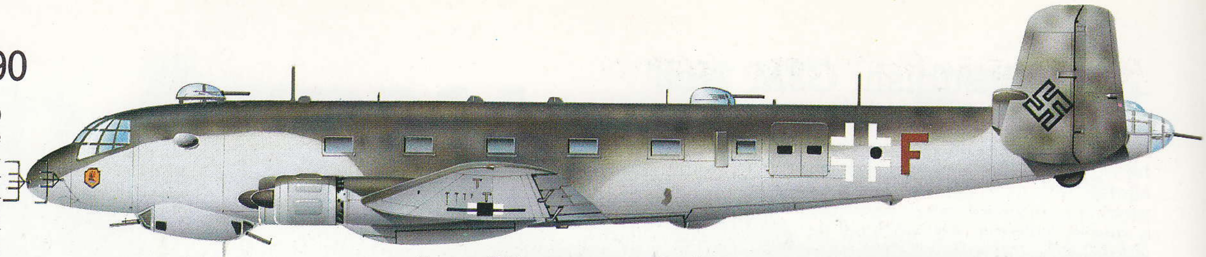
PQ.18 was the last North Cape convoy to run the gauntlet of all-out attack by the Luftwaffe; the presence and survival of the *Avenger* discouraged the German high command to the extent of withdrawing most of the bombers to other war theatres. (The *Avenger* was to be torpedoed later in 1942 during the 'Torch' landings, when she blew up with the loss of most of her crew.) The North Cape convoys nevertheless continued to sail until April 1945, and losses were suffered from time to time, mostly from attacks by U-boats. Never again, though, did the Luftwaffe attempt to mount large-scale air attacks when the raiders risked interception by carrierborne fighters.



Throughout the war at sea the Condors were active, wreaking havoc amongst Allied shipping and directing U-boats to suitable targets. At the heart of this was the Condor's excellent endurance, which had been established before the war by the German airline Lufthansa.

GERMANY

Junkers Ju 290



Fernaufklärungsgruppe (FAGr) 5 was the only operator of the Junkers Ju 290 maritime versions and used these from Mont de Marsan in France. The A-7 variant could carry up to three of the Hs 293A missiles.

Developed directly from the Ju 90 commercial and military transport, the four-engine **Junkers Ju 290** was intended to replace the Focke-Wulf Fw 200 Condor which by 1942 was proving slow and vulnerable when confronted by RAF aircraft over the 'narrow seas' around Europe. Developments of the Ju 290 nevertheless embraced considerable work to suit it for the transport role, and it was not until early 1943 that the **Ju 290A-1** underwent extensive modification as a maritime reconnaissance aircraft, including the installation of marine radio, FuG 200 Hohentwiel sea search radar and a second dorsal HDL 151 gun turret mounting an MG 151/20 cannon.

At the same time a long-range reconnaissance group, Fernaufklärungsgruppe 5, was formed and during the late summer of 1943 three of the new Ju 290A-2s were delivered to its 1.Staffel, which became operational at Mont de Marsan in France on 15 October of that year. Five **Ju 290A-3** aircraft with more powerful BMW 801D engines followed, as did five **Ju 290A-4** aircraft with improved dorsal turrets. In November a second *Staffel* was activated and, with a range of over 6100 km (3,790 miles) the Ju 290s ranged far out over the Atlantic, relaying convoy sightings to U-boats. Eleven **Ju 290A-5** aircraft with increased armour protection and 20-mm cannon in place of the earlier beam machine-guns were delivered to FAGr 5 early in 1944, as were about a dozen of the **Ju 290A-7** variant; the latter was a true anti-shipping strike aircraft capable of carrying either three Henschel Hs 293 or Fritz X weapons under fuselage and wings. It also featured a new nose section combining a nose gun position with 20-mm cannon with the FuG 200 aerial array. Only three **Ju 290A-9** aircraft were completed with reduced armament and increased fuel capacity which bestowed a maximum range of 8000 km (4,971 miles).

As the Battle of the Atlantic swung irrevocably in favour of the Allies with the loss by the Germans of French bases in August 1944, FAGr 5 was withdrawn eastwards and began operating as a transport unit, some of the Ju 290s even being flown nonstop to Manchuria carrying special supplies to the Japanese and returning with raw materials vital to Germany.

Specification

Junkers Ju 290A-5

Type: nine-seat maritime reconnaissance aircraft

Powerplant: four 1,700-hp (1267.7-kW) BMW 801D air-cooled radial piston engines

Performance: maximum speed 440 km/h (273 mph) at 6000 m (19,685 ft); climb to 1000 m (3,281 ft) in 4.2 minutes; service ceiling 6000 m (19,685 ft); maximum range 6150 km (3,822 miles)

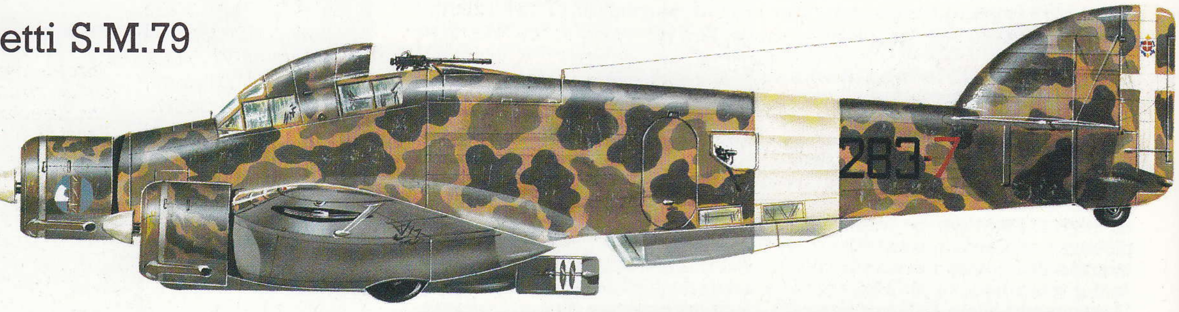
Weights: empty about 27700 kg (61,067 lb); maximum take-off 45000 kg (99,206 lb)

Dimensions: span 42.00 m (137 ft 9.5 in); length 28.64 m (93 ft 11.5 in); height 6.83 m (22 ft 4.75 in); wing area 204.00 m^2 (2,195.9 sq ft)

Armament: six MG 151/20 20-mm cannon in ventral gondola, two dorsal turrets, a tail position and two beam hatches, and one 13-mm (0.51-in) machine-gun in the ventral gondola; bombs were not normally carried

ITALY

Savoia-Marchetti S.M.79



Operating in the Mediterranean in 1942, this Savoia-Marchetti S.M.79 served with the 283ª Squadriglia, 130° Gruppo Autonoma. One torpedo is carried beneath the fuselage.

Developed from an eight-seat commercial airliner of 1934, the three-engine **Savoia-Marchetti S.M.79 Sparviero** entered service as a conventional medium bomber with the Regia Aeronautica in 1937, and served operationally with the Aviacion del Tercio alongside the Nationalist forces during the Spanish Civil War. Also in 1937 the S.M.79 embarked on trials at Gorizia as a torpedo bomber, being equipped to launch a single 450-mm (17.7-in) naval torpedo from an offset rack under the fuselage. The following year trials with paired torpedoes led to the adoption of the **S.M.79-II** aircraft as standard torpedo bomber equipment. Following Italy's entry into the war in June 1940, when Sparvieri (sparrowhawks) equipped 14 *stormi* based in Italy, Sicily, Sardinia and Libya, the aircraft was constantly in action in the anti-shipping role, its first action being an attack by 19 S.M.79s of the 9° and 46° Stormi on French shipping off the Riviera coast on 13/14 June.

During the invasion of Crete S.M.79s of the 92° Gruppo and the 281ª Squadriglia were active against Allied shipping in the Aegean, after which most aircraft were redeployed to Libya for operations against British naval forces and convoys in the Central Mediterranean as well as the naval base at Malta. Among the ships of the Royal Navy sunk by S.M.79s in the Mediterranean were the destroyers HMS *Husky*, HMS *Jaguar*, HMS *Legion*, and HMS *Southwall*, while the battleship HMS *Malaya* and the carriers HMS *Indomitable* and HMS *Victorious* were all struck by torpedoes launched by the Italian torpedo bombers; the majority of these ships were hit during the attacks on the Operation 'Pedestal' convoy which sailed with 14 merchant ships and heavy escort for the relief of Malta. Among the famous Italian pilots of the Sparviero were men such as Capitani Buscaglia, Cimicchi, di Bella and Melley. An improved version was the **S.M.79-III** without the ventral gondola but with a forward-firing 20-mm cannon.

Despite the obvious value of the S.M.79 to the Axis forces in the Mediterranean, the aircraft (like so many Italian aircraft) suffered from poor servicing facilities, and it was unusual for even as much as half the available strength of Sparvieri to be fit for operations at any given time. Nevertheless the S.M.79 was acknowledged as being among the best torpedo aircraft to serve in the Mediterranean theatre during World War II.

Specification

Savoia-Marchetti S.M.79-II

Type: five-seat torpedo bomber

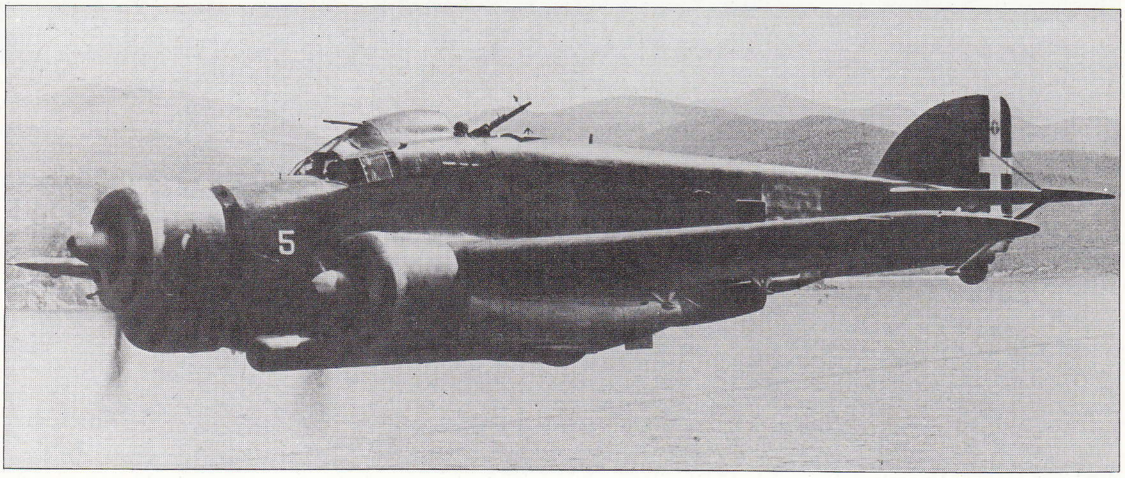
Powerplant: three 1,000-hp (745.7-kW) Piaggio P.XI RC 40 air-cooled radial piston engines

Performance: maximum speed 435 km/h (270 mph) at 3650 m (11,975 ft); service ceiling 7000 m (22,966 ft); normal range 2000 km (1,243 miles)

Weights: empty 7600 kg (16,755 lb); maximum take-off 11300 kg (24,912 lb)

Dimensions: span 21.20 m (69 ft 6.66 in); length 16.20 m (53 ft 1.75 in); height 4.10 m (13 ft 1.5 in); wing area 61.7 m^2 (664.14 sq ft)

Armament: three 12.7-mm (0.5-in) Breda-SAFAT machine-guns in two dorsal positions and one ventral position, and one 7.7-mm (0.303-in) Lewis gun on a sliding mount in the rear fuselage to provide beam defence plus two 450-mm (17.7-in) torpedoes or 1250 kg (2,756 lb) of bombs.



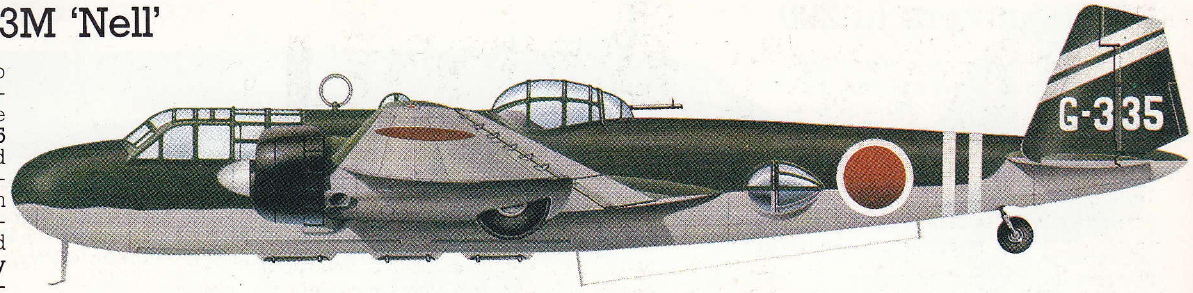
The S.M.79 was a fine torpedo-bomber which scored many hits against Allied shipping in the Mediterranean. It was fast for its size, and this enabled it to become one of the best Italian aircraft.

JAPAN

Mitsubishi G3M 'Nell'

As far back as 1935, in response to Japanese naval requirement for a land-based twin-engine reconnaissance aircraft, Mitsubishi flew the first **Ka-15** prototype, an aircraft which possessed a design potential that allowed development as a long-range medium bomber. Accordingly, following successful flight trials, the aircraft entered production in June 1936 as the **Navy Type 96 Attack Bomber Model 11 (Mitsubishi G3M1)**. The initial version, of which 34 were produced, was powered by 910-hp (678.6-kW) Kinsei 3 radials and possessed a maximum speed of 360 km/h (224 mph) at 1975 m (6,480 ft). As the improved Kinsei 41 and 42 engine became available in 1937 a new version, the **G3M2**, started production and, with a total of 581 built by mid-1941, was the principal variant. With a top speed now increased to 374 km/h (232 mph), a bombload of up to 800 kg (1,764 lb) carried externally and a defensive armament of three 7.7-mm (0.303-in) machine-guns, the G3M2 possessed a maximum range of 4380 km (2,722 miles). A yet further improved version, of which production was undertaken by Nakajima during 1941-3, was the **G3M3** with 1,300-hp (969.4-kW) Kinsei 51 radials and a top speed of 415 km/h (258 mph) at 6000 m (19,685 ft).

Mitsubishi G3M2s were first flown in action by the Japanese navy's Kanoya Kokutai in August 1937 in raids on Hangchow and Kwangteh in China. By 1940 four *kokutais* in China were equipped with a total of about 130 G3M2s, a number that grew to 204 by the date of Pearl Harbor with the deployment of forces against Wake Island, the Philippines and the Marianas. And it was a force of 60 G3M2s of the Genzan and Mihoro Kokutais (with 26 Mitsubishi G4M1s of the Kanoya Kokutai) which, flying from bases in Indo-China, found and sank the British warships HMS *Prince of Wales* and HMS *Repulse* as they steamed without fighter protection off the Malayan coast on 10 December 1941. The type was known to the Allies as the **'Nell'**.



Mitsubishi G3M2 of the Genzan Kokutai flying from Saigon, Indo-China, in December 1941. This aircraft participated in the sinking of HMS Prince of Wales *and* Repulse.

Specification

Mitsubishi G3M2 Model 22

Type: five/seven-seat medium/ torpedo bomber

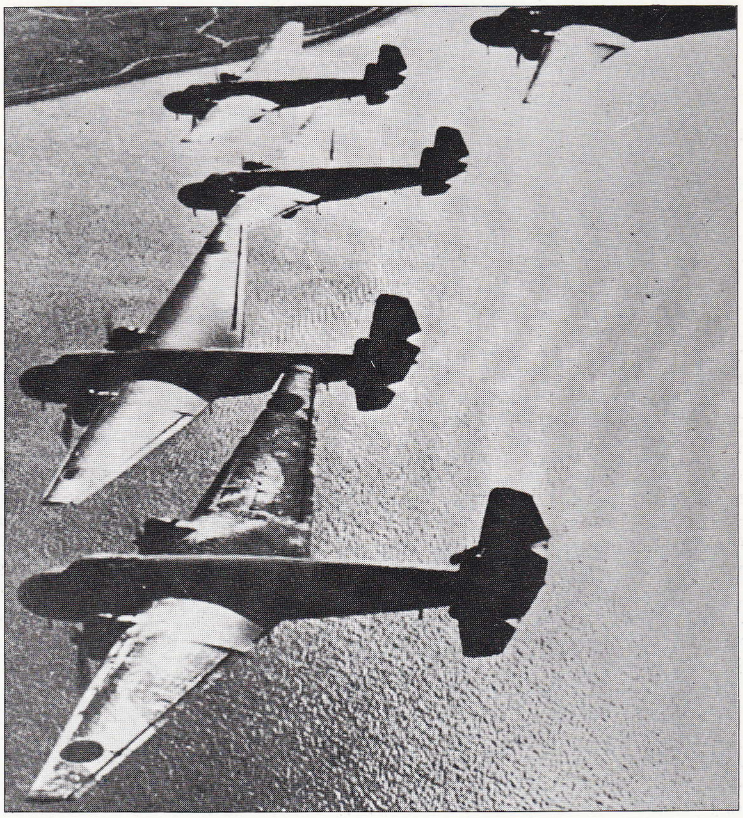
Powerplant: two 1,075-hp (801.6-kW) Mitsubishi Kinsei 45 14-cylinder air-cooled radial piston engines

Performance: maximum speed 374 km/h (232 mph) at 4200 m (13780 ft); climb to 3000 m (9,843 ft) in 8.34 minutes; service ceiling 9130 m (29,954 ft); maximum range 4380 km (2,722 miles)

Weights: empty 4965 kg (10,946 lb); maximum take-off 8010 kg (17,659 lb)

Dimensions: span 25.00 m (82 ft 0.25 in); length 16.45 m (53 ft 11.66 in); height 3.685 m (12 ft 1.1 in); wing area 75.0 m^2 (807.32 sq ft)

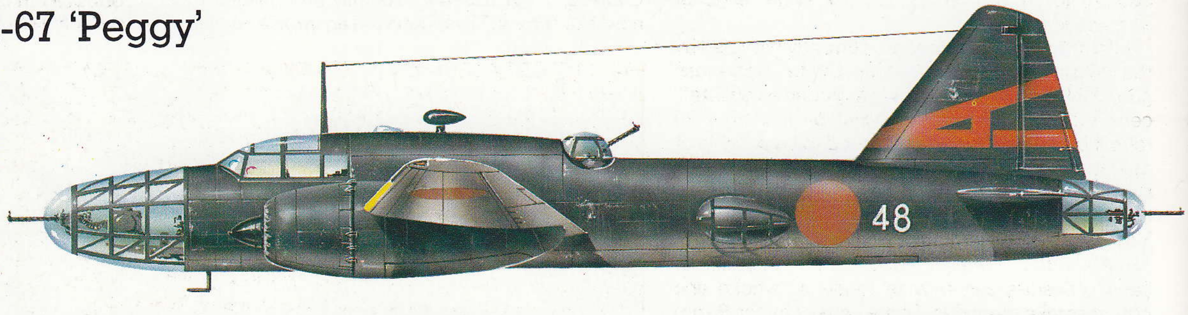
Armament: three 7.7-mm (0.303-in) Type 92 machine-guns in a retractable dorsal turret and two lateral blisters, and one 20-mm Type 99 cannon in a second dorsal turret, plus one 800-kg (1,764-lb) torpedo or equivalent bomb load carried externally



A formation of Mitsubishi G3Ms cross the Japanese coast during a training exercise. This aircraft was widely used, especially in the early days of the war, on all kinds of maritime operations, including torpedo dropping, bombing and patrol. Its successor, the same company's G4M, was employed alongside the G3M on similar missions.

JAPAN

Mitsubishi Ki-67 'Peggy'



Like the Ki-21 and G4M, the **Mitsubishi Ki-67** was classified by the Japanese as a heavy bomber, yet by Western standards would have scarcely rated the medium bomber category. It was nevertheless the best bomber to serve Japan in the war, albeit too late to influence the tide of events of the last year. By then the American air raids on the Japanese homeland were devastating aircraft plants and production was seriously affected. The Ki-67 Hiryu (flying dragon) was designed to a 1940 specification, issued in 1941, for a strategic bomber intended for use in an anticipated war with the Soviet Union on the Siberia-Manchukuo border. By departing from established Japanese practice and including armour protection and self-sealing fuel tanks, design of the prototype Ki-67 was protracted, and it was not until 27 December 1942 that the first aircraft flew; it proved to be highly manoeuvrable and pleasant to fly, and possessed a top speed of 538 km/h (334 mph). In the same month it was decided to adapt some Ki-67s as torpedo-bombers. The army put forward such a host of suggestions for additional equipment that production suffered long delays, and it was not until October 1944 that the Ki-67 (codenamed **'Peggy'** by the Allies) was first flown in combat by the 7th and 98th Sentais, and by the navy's 762nd Kokutai in the torpedo role during the battle off Formosa. Thereafter modifications were held to a minimum as production was afforded the highest priority; but by then American raids (and a devastating earthquake in December 1944) severely disrupted production, and no more than 698 Ki-67s were produced, some of them being flown in *kamikaze* strikes in the last months of the war.

Specification

Mitsubishi Ki-67

Type: six/eight-seat heavy bomber

Powerplant: two 1,900-hp (1416.8-kW) Mitsubishi Ha-104 radial piston engines

Performance: maximum speed 537 km/h (334 mph) at 6090 m (19,980 ft); climb to 6000 m (19,685 ft) in 14.5 minutes; service ceiling 9470 m (31,070 ft); range 2800 km (1,740 miles)

Weights: empty 8649 kg (19,068 lb); normal loaded 13765 kg (30,347 lb)

Dimensions: span 22.50 m (73 ft 9.75 in); length 18.70 m (61 ft 4.25 in); height 7.70 m (25 ft 3.2 in); wing area 65.85 m^2 (708.8 sq ft)

Proving highly manoeuvrable and fast, the Mitsubishi Ki-67 Hiryu was used in the torpedo role (especially during the Battle of Formosa). Production of this effective aircraft was severely restricted following American bombing raids and an earthquake.

Armament: single trainable 12.7-mm (0.5-in) Type 1 machine-guns in nose, two beam positions and tail, and one 20-mm Ho-5 cannon in dorsal turret, plus a bombload of 800 kg (1,764 lb) or one 1070-kg (2,359 lb) torpedo, or 2900-kg (6,393-lb) of bombs for *kamikaze* mission

British Army
Part 3

The equipment used by the British army is provided largely by a home-based armaments industry comprising both public and private concerns. Largest of the public-owned suppliers are the Royal Ordnance Factories, who produce a variety of weapons ranging from artillery to ammunition. Plans are currently under way to denationalize the Royal Ordnance Factories by a public sale of shares. Some weapons, such as the 155-mm (6.1-in) FH-70, have come to the army via international development programmes, but these projects are few, and much of the equipment not produced within the United Kingdom is purchased from the United States.

Infantry weapons

The standard service rifle is the 7.62-mm (0.3-in) Rifle L1A1, an anglicized version of the Belgian FN FAL. This has been in service for nearly 30 years and is due to be replaced by a new 5.56-mm (0.219-in) Individual Weapon (IW), a bullpup design produced by the Royal Small Arms Factory at Enfield Lock. The IW will replace not only the L1A1 but the L2A3 Sterling sub-machine gun which is currently used by many second-line units and support troops such as artillery, signals and the Royal Engineers.

The standard machine-gun is the 7.62-mm (0.3-in) General-Purpose Machine-Gun, or GPMG, which may be used either on a heavy tripod or on a bipod. In both forms it uses belt-fed ammunition and fires at a cyclic rate of up to 750 rpm. Several versions exist, including some for use on armoured vehicles. The GPMG is primarily an infantry weapon and many back-up units continue to use the 7.62-mm (0.3-in) L4A4 light machine-gun, an updated version of the World War II Bren Gun. This is also scheduled for replacement by the new 5.56-mm (0.219-in) Light Support Weapon (LSW) that shares many components with the IW.

Mortars in use include the 51-mm (2.0-in) Mortar L9A1 with a maximum range of 750 m (820 yards). This is a section or platoon weapon firing HE bombs weighing just over 1 kg (2.2 lb). The main infantry support mortar is the 81-mm (3.19-in) L16A1, a very effective weapon with a maximum range of over 5650 m (6,180 yards) and firing a wide range of ammunition.

Infantry anti-tank defence is currently provided by the 84-mm (3.3-in) L14A1 'Carl Gustav' recoilless gun. This gun is now generally regarded as obsolescent and is due for replacement by the LAW 80 rocket launcher. This is understood to be capable of defeating any known tank using a 94-mm (3.7-in) rocket. The 66-mm (2.6-in) L1A1 HEAT rocket launcher is also in service but is now regarded as obsolete.

Other infantry weapons include the L2 series of hand grenades and a wide range of smoke and irritant smoke grenades. Some units carry the 9-mm (0.354-in) L9A1 Browning automatic pistol, and the American M16 5.56-mm (0.219-in) rifle is used by some specialist units. These specialist units might also make use of the L34A1 silenced version of the Sterling sub-machine gun. Snipers use the 7.62-mm (0.3-in) L42A1 rifle, a modernized version of the Lee-Enfield rifle of World War II.

Anti-tank and anti-aircraft missiles

The main long-range guided anti-tank weapon in use is the Swingfire, a powerful missile with a weight of 37 kg (81.57 lb) and a range of up to 4000 m (4,375 yards). It is carried on and fired form the FV102 Striker and the FV438 and can knock out any known tank at very long range; guidance is by wires. These tracked carriers will soon be supplemented by three battalions of FV103 Spartans, each mounting two roof-mounted Milan missiles; Milan is currently fired from a small portable launcher that is widely issued among infantry units in BAOR. It has a range of up to 2000 m (2,185 yards) and each missile weighs 6.65 kg (14.66 lb); wire guidance is used.

Forward area air defence is carried out by the Blowpipe, soon to be replaced by an updated version known as Javelin. This shoulder-launched system has a range of 3000 m (3,280 yards) but it is normally used at shorter ranges. The Javelin uses a revised guidance system. Air defence of the rear areas is provided by the Rapier, a complex air defence system that uses both visual and radar-based detection and guidance. The maximum operational height of Rapier is 3000 m (3,280 yards) and it is very accurate. Until recently most Rapiers were towed behind Land Rovers, but these are now being supplemented by Tracked Rapier which is based on a tracked chassis derived from that of the M113 armoured personnel carrier used by the US Army. Each Tracked Rapier unit is fully self-contained and uses American M548 tracked cargo carriers for replenishment.

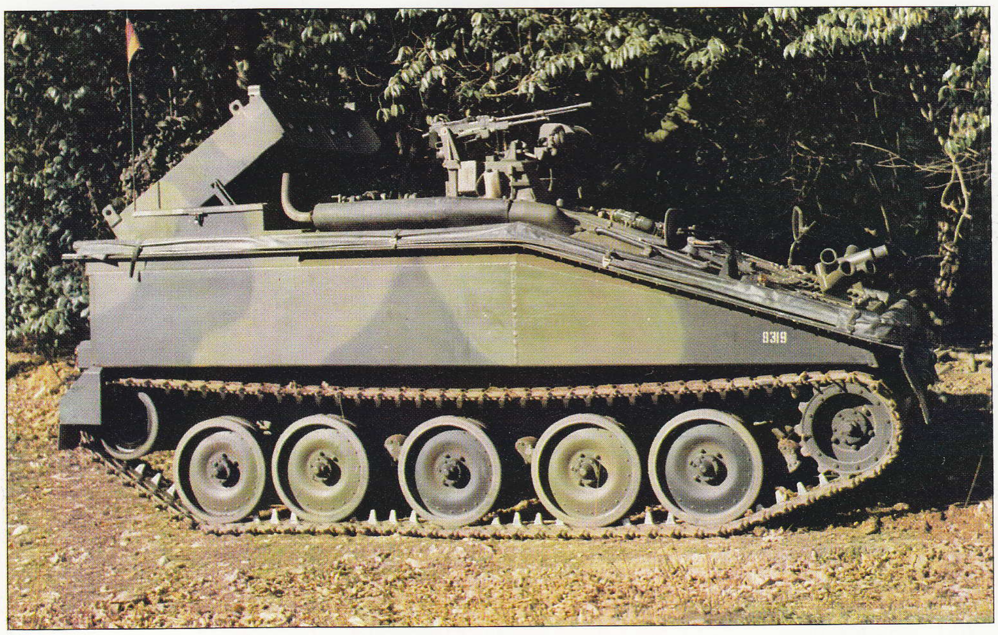
Armour

The main striking force of the Royal Armoured Corps is now provided by the FV4030/4 Challenger, now in service in BAOR and scheduled to equip five armoured regiments. This powerful tank is armed with a 120-mm (4.72-in) main gun and by the end of this decade there will be 307 in service. The Challenger is a heavy tank weighing 62 tonnes (136,686 lb) and requires some equally heavy and powerful back-up equipment such as bridging, but it is well-armoured with composite armour and uses a powerful engine providing 1,200 bhp (895 kW).

The Enfield Individual Weapon is scheduled to replace both the Self-Loading Rifle and the Sterling SMG in British service. Short and handy and fitted with an optical sight as standard, it fires the excellent Belgian SS109 5.56-mm round at a cyclic rate of 650-800 rpm.

As the Challenger enters service, BAOR armoured regiments continue to rely on the FV4201 Chieftain which has been in service since 1967 but is still one of the most powerful tanks in the world. It uses the same 120-mm (4.72-in) gun now carried by Challenger but this will eventully be replaced by a new 120-mm (4.72-in) gun with an improved overall performance; this gun will also be fitted to the Challenger. Compared with the Challenger, the Chieftain is ponderous and slow but has excellent armour and a good fire-control system, and updates of all aspects will continue as the Chieftain will continue to provide the bulk of the armour in BAOR for years to come.

Reconnaissance vehicles are provided by a family of vehicles based on the FV101 Scorpion. This is a small vehicle with a three-man crew and weighing 7938 kg (17,500 lb). It mounts a 76-mm (3-in) gun in a turret while its close counterpart, the FV107 Scimitar, has a 30-mm (1.18-in) RARDEN cannon. Other vehicles in this range have box-bodied superstructures for a variety of roles, and include the FV102



Carrying five British Aerospace Swingfire Anti-Tank Guided Missiles, the FV102 Striker is a formidable anti-tank system. The missile controller can operate the missiles by remote control from outside the vehicle, enabling them to be launched over hill crests or from behind cover.

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Produced as a combined project between Britain, Germany and Italy, the FH70 155-mm gun has now replaced the old 5.5-in howitzer in British service. A new range of 155-mm ammunition has been developed for the FH70. Its basic 43.5-kg (96-lb) shell is thin-walled and has high fragmentation effect.

In June 1980 it was announced that GKN Sankey's MCV 80 won the competition to produce the new armoured personnel carrier for the British army. Armed with a 30-mm RARDEN cannon and a Hughes 7.62-mm chain gun, the MCV80 has good mobility and carries eight fully equipped infantry.

Striker mentioned above in the Swingfire role, the FV103 Spartan armoured personnel carrier (soon to carry Milan anti-tank guided missiles), the FV104 Samaritan armoured ambulance, the FV105 Sultan command post and the FV106 Samson armoured recovery vehicle. It is possible that these vehicles will be joined by an open-decked load and equipment carrier known as Streaker.

The FV721 Fox is a wheeled reconnaissance vehicle mounting a 30-mm (1.18-in) RARDEN cannon, and is used by TA yeomanry units.

The basic armoured personnel carrier is the FV432 which is little more than an armoured box on tracks. It normally carries up to 12 men including the crew, but is used in a wide variety of roles ranging from command post to ambulance and 81-mm (3.19-in) mortar carrier. Some versions use a roof-mounted turret with a 7.62-mm (0.3-in) GPMG machine-gun. The British army has a large number of these FV432s, and every unit seems to have its own particular 'fit' of equipment. Current plans are for the FV432s to be supplemented in BAOR by a new armoured personnel carrier known as MCV-80, a faster vehicle with a crew of two and up to eight soldiers. Production has yet to start, but a range of vehicles with machine-gun and cannon-armed turrets is proposed.

Another personnel carrier is the new Saxon, a wheeled armoured vehicle carrying up to 10 passengers and mainly intended for use by the 19th Infantry Brigade (a BAOR formation based in the United Kingdom). It is now entering service and several versions, including command and recovery versions, are planned. Some versions will have machine-gun turrets.

Other armour includes a variety of support vehicles including the Centurion AVRE armed with either a 165-mm (6.5-in) demolition gun or a 105-mm (4.13-in) tank gun firing High Explosive Squash Head (HESH) projectiles. These vehicles are used for combat engineering and also have dozer blades or mine ploughs plus a variety of other equipment. Also used in the combat engineering role is the Chieftain AVLB that is capable of laying assault bridges up to 24.38 m (80 ft) long. The Chieftain and Centurion chassis are also used in the armoured recovery vehicle role, but the introduction of the Challenger has required the provision of a new Chieftain variant equipped with a crane and more powerful winches known as the Chieftain ARRV (armoured repair and recovery vehicle).

Ferret scout cars are still used by a number of support units for liaison and general reconnaissance duties. Some of them continue to carry a single 0.3-in (7.62-mm) L3A3 Browning machine-gun. Other older vehicles still in use include the FV1611 Humber 'Pig' armoured personnel carrier still in use in Northern Ireland, and the FV603 Saracen, still in use for a number of specialized roles and as a command vehicle with some yeomanry units. The Shorland personnel carrier based on the Land Rover is used in Northern Ireland, while in Cyprus a small number of Saladin armoured cars are still used for patrolling.

One very specialized armoured vehicle not yet mentioned is the Combat Engineering Tractor used by the Royal Engineers. This unarmed two-man vehicle is amphibious and can be used for a range of combat engineering tasks from digging to obstacle clearance.

Although it is not armoured, mention must be made of the tracked Bx202E over-snow vehicles. These Swedish vehicles are used by units operating in Norway in a range of roles from personnel carrier to command post. They are also used to tow artillery.

Artillery

As a general rule artillery in BAOR is self-propelled, and towed artillery is used elsewhere. The most powerful artillery weapon is the nuclear Lance missile with a range of up to 121000 m (132,325 yards). It is carried on a tracked chassis derived from the American M113 armoured personnel carrier, and it is the most powerful weapon the army uses. Also in the nuclear bracket is the American 203-mm (8-in) M110A1 self-propelled howitzer that can fire a 92.53-kg (204-lb) shell to a range of 21300 m (23,294 yards).

Next in calibre downwards is the 175-mm (6.89-in) M107, another American gun that uses the same chassis as the M110A1. This is a long-range gun that fires a 66.67-kg (147-lb) shell to a range of 32700 m (35,760 yards), and is used mainly in the counter-battery role. It was intended to replace this gun by the American Multiple Launch Rocket System (MLRS), but the procurement of this long-range rocket system has now been delayed until 1988 at the earliest.

Mainstay of the BAOR artillery regiments is the 155-mm (6.1-in) M109A2, an American equipment that fires a 43-kg (94.8-lb) shell to a range of 18100 m (19,795 yards). Also in use in BAOR is the 105-mm (4.13-in) Abbot, a British gun now regarded as obsolescent as its 15.1-kg (33.29-lb) shell is now regarded as too light to break up armoured attacks. It was hoped at one time that both the Abbot and the M109A2 would be replaced by the 155-mm (6.1-in) SP-70, an international programme, but hardware for this project is still a long way in the future.

Towed artillery includes the 155-mm (6.1-in) FH-70 and the 105-mm (4.13-in) Light Gun. The FH-70 fires a 43.5-kg (95.9-lb) shell to a range of 24000 m (26,246 yards) and has its own auxiliary power unit to make short moves and to power some of the howitzers in and out of action operations. The Light Gun has proved itself to be the best in the world for rapidly-deployed forces, and was used during the Falkland Islands campaign. It fires a 15.1-kg (33.29-lb) HE shell to a range of 17200 m (18,810 yards) but weighs only 1858 kg (4,096 lb) in action.